

## A Taxonomic Revision of *Anemone* L. Subgenus Anemonanthea (DC.) Juz. sensu lato (Ranunculaceae) I

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(Received on July 11, 2003)

As treated here, *Anemone* subgen. Anemonanthea includes three sections (viz., Anemonanthea, Rosulantes sect. nov. and Tuberosa). Two sections (viz., Stolonifera and Keiskea) are separated from the foregoing ones and placed in a different subgenus, viz., Stolonifera, comb. and stat. nov. We elaborated a conspectus of subgenus Anemonanthea s. l., together with a very short morphological delimitation of two subgenera, five sections and 11 series, included latin diagnoses of seven new infrageneric taxa.

A key for determination of subgenera, sections, series and species is included. For delimitation of the taxa within Anemonanthea s. l., although we used the morphological characters as given by Tamura (1995), in our research we have included additional essential characters (viz., chromosome numbers, types of pollen grains and carpels, germination type and time of basal leaf development, types of rhizomes, shoot structure, shape and size of basal and involucral leaves, tepal number, shape, venation and villosity).

In this Part I the species No. 1 to No. 13 are taxonomically revised.

**Key words:** *Anemone*, morphology, phylogeny, subgenus Anemonanthea, taxonomy.

*Anemone nemorosa* L. and its allied species (sect. Anemonanthea sensu DC.) are mainly geophytic ephemeroids with long sympodial rhizomes, ternate or 3-sected basal leaves, 1–few-flowered scapes, and short-puberulent achenes with short persistent styles and which are distributed in shady localities within the temperate floras of the Northern Hemisphere. Beginning with Pritzel (1841), the author of the first monograph on genus *Anemone*, until the present time, there are many different opinions on the size and structure of the above group of

species, its taxonomic rank, and state and relationships among its members. The aim of our paper is to examine the taxa of *Anemone* subgenus Anemonanthea, and specify their status and relationships.

### Materials and Methods

Our treatment is based mainly on herbarium material involving about 2000 specimens contained in more than 20 collections (BM, CLU, E, GH, J, K, KW, LE, NY, TNS, US, VLA, W, WU, etc.; abbreviations according to Holmgren et al. 1990). From

these specimens, both flower and fruit samples (about 400) were studied. Standard anatomical techniques were employed, including light and scanning microscopy (the latter for examination of achenes). We also examined ca. 300 plants collected mainly in 1990–1997 in ca. 20 natural populations of five taxa.

### Literature Survey

*Anemone nemorosa* L. and three allied species (*A. trifolia* L., *A. ranunculoides* L. and *A. quinquefolia* L.) were described by Linnaeus (1753). Initially these taxa were included in sect. *Anemonanthea* DC. (Candolle 1817, 1824), together with plants having tuberous rhizomes (viz., *A. coronaria* L.), and as circumscribed by Candolle this section initially consisted of plants with both lanate and subglabrous achenes.

Shortly after Candolle's taxonomic treatment, Gaudin (1828) circumscribed the *A. nemorosa*-group as sect. *Sylvia*. A number of authors have followed Gaudin's treatment (viz., Spach 1838, Janczewski 1892, Chater 1973, Hoot et al. 1994), but other authors (viz., Pritzel 1841, Prantl 1887, Ulbrich 1906, Fernald 1928, Wang 1974, 1980) simply left this group the name *Anemonanthea*.

Pritzel (1841) produced first monograph on *Anemone* in which he classified within sect. *Anemonanthea* several allied species (*A. nemorosa* and *A. ranunculoides*), but also *A. richardsonii* Hook. and *A. antucensis* Poepp., both of which are rather unlike the two former species. According to Finet and Gagnepain (1904), *A. nemorosa*, *A. nikoensis* Maxim. and other closely related species were included in a so called fourth section, together with *A. hepatica* L. and other species which were apparently distant from this group.

The second comprehensive monograph on *Anemone* was by Ulbrich (1906) who divided sect. *Anemonanthea* into three subsections: *Sylvia* Gaudin (*A. nemorosa* and allied

species, with elongate rhizomes and petiolate involucral leaves), *rhizomes* and *petiolate involucral leaves*), and *Stolonifera* Ulbr. (*A. baicalensis* Turcz. and allied species, with stolon-like rhizomes and mainly sessile reduced involucral leaves).

The Russian taxonomist Juzepchuk later raised the rank of sect. *Anemonanthea* to a subgenus with three sections (which correspond to the Ulbrich's subsections) plus several series (Juzepchuk 1937).

Tamura (1967) was the first to regard the *A. nemorosa* complex as sect. *Anemone*. In subsequent papers, Tamura (1991, 1995) followed mainly the work of Juzepchuk in accepting this group of taxa as subgen. *Anemonanthea*, but he correctly recognized *A. nemorosa* and allied species as sect. *Anemonanthea* (not *Anemone* nor *Sylvia*) because of De Candolle's priority. According to Tamura (1995), subgenus *Anemonanthea* includes four sections, viz., *Anemonanthea*, *Stolonifera*, *Tuberosa*, plus *Keiskeana* Tamura.

On the other hand, there were several attempts to regard this group of species as genera—*Anemonoides* Mill. (Miller 1754) or *Anemonanthea* (DC.) S.F.Gray (Gray 1821). Several years ago these proposals were supported by Holub (1973) and later by Starodubtsev (1989, 1991). Moreover, Starodubtsev proposed to separate two small groups of species of *Anemonanthea* as genera (*Tamuria* Starod. and *Arsenjevia* Starod.).

Hoot et al. (1994) recently proposed a classification scheme of *Anemone* quite different from the preceding authors in that, according to them, the *A. nemorosa* and *A. baicalensis* groups belong to diverse subgenera: the *A. nemorosa* complex to subgen. *Anemone* (plants with  $x = 8$ ), sect. *Anemone* (*A. nemorosa*, *A. baldensis* L., *A. multifida* Poir., etc.), and the *A. baicalensis* complex was placed in subgen. *Anemonidium* (plants with  $x = 7$ ), sect. *Keiskea* (*A. baicalensis*, *A. keiskeana* T.Ito ex Maxim., etc.).

On the basis of new molecular data, Ehrendorfer and Samuel (2001) confirmed the affinities of the *A. nemorosa* and *A. blanda* groups.

### Biological and Morphological Characteristics

All plants within subgenus Anemonanthea are characterized by prostrate, more or less elongate, sometimes tuberous rhizomes, few long-petiolate basal leaves (sometimes absent at the base of stem), 3-leaved involucres, one to four flowers with 5 to 20 tepals, sessile or rarely stalked, scarcely compressed, short-hirsute or rarely glabrate achenes with curved or straight styles and usually capitate stigmas (cf. Tamura 1995). Flowering occurs mainly in spring (ephemerals and geophytes). The plants prefer to grow in shady forests or under bushes, and hypogeal germination is found in many species.

Our comparative analysis confirmed the presence in these taxa of most of the foregoing characters. However, there is a rather distinct differentiation within subgen. Anemonanthea sensu Tamura of several essential characters such as the type of rhizome (long thin, short-nodulose or tuberous), shoot structure (non-rosetteous or semirosetteous), time of basal leaf development (before or after anthesis), shape of basal parts of the basal leaf petioles (narrow, vaginated or sharply dilated and scale-like), types of basal leaves (long-petiolate with distinct blades or small and scale-like), size and shape of involucral leaf petioles and blades, and tepal number, shape, venation and villosity. Moreover, plants within this subgenus differ in their chromosome numbers ( $x = 8$  or  $x = 7$ ; Kurita 1955, 1956, Baumberger 1970, Starodubtsev 1991a, 1991b, unpublished data of Qin-Er Yang, etc.), types of pollen grains (3-colporate, pentalporate or polycolporate; Kumazawa 1936, Huynh 1964, 1970, Savitski 1982, etc.), morphological variation of the carpels and achenes (sessile or stalked,

with distinct or hardly recognizable styles, and linear or dilated, sometimes subcapitate stigmas), and germination type (epigeal or hypogeal; Tamura et al. 1977, Ziman 1985, Barykina and Potapova 1994, etc.). We used these characters, in addition to those mentioned by Tamura, for delimitation of taxa within the subgen. Anemonanthea s. l.

According to Tamura, sect. Anemonanthea is characterized by 3–5-sected, ternate to biternate petiolate basal leaves, well-developed 3-sected to ternate involucral leaves, 1–3-flowered cymes, many ovoid to ellipsoid, hardly compressed, short-pubescent, sessile achenes with short or slightly elongate styles, and elliptic or capitate stigmas, and achenes arranged in globose heads.

In addition to these characters, the taxa of sect. Anemonanthea have several important characteristics in common: several basal scale-like and persistent leaves, in addition to solitary leaves with long narrow petioles and distinct blades which develop after anthesis on rhizomes distinct from reproductive shoots (which are sometimes regarded as absent because they soon perish), hypogeal germination, and 3-colporate pollen grains.

However, it is necessary to separate several species from sect. Anemonanthea because they have several basal leaves with distinct blades developing before anthesis, lack of scale-like leaves (but basal remnants of old leaf petioles), epigeal germination, and pantocolporate pollen grains. These species are classified under sect. Rosulantes.

Within both sections there are plants with either a monomorphic or a dimorphic perianth, dilated or filiform filaments, puberulent or subglabrous ovaries and achenes (some with narrow lateral ribs), with linear or subcapitate stigmas. Therefore we regard these sections as including several series: Anemonanthea with five series [Anemonanthea (= Hylalectron), Reflexae Ulbrich, Altaicae Starod.], and two new ones

(Nikoenses and Quinquefoliae, series nov.), and Rosulantes with two series (Rosulantes and Exiguae, series nov.).

According to Tamura, plants of sect. Tuberosa have tuberous rhizomes, 3–5-sectored or ternate basal leaves, well-developed petiolate involucral leaves similar to basal leaves, solitary flowers with 8–20 linear-oblong tepals, sessile achenes, these mainly ovoid, hardly compressed and shortly pubescent.

In our opinion, the following characters are also essential for sect. Tuberosa: basal leaves which develop before anthesis, their petioles basally sharply dilated ("ears") and scale-like, germination epigeal, and 3-colporate pollen grains. In addition, these plants have a dimorphic perianth, and the subglabrous ovaries and achenes.

As stated by Tamura, sect. Stolonifera is characterized by fleshy or thin rhizomes, 1 to few basal 3–5-sectored to ternate leaves, two or three sessile involucral leaves (often reduced and basally connate), solitary flowers with 5–6 tepals, and sessile, scarcely compressed, mainly ovoid and shortly pubescent achenes with short styles and nearly sessile capitate stigmas.

However, we are adding to these characters the presence of short stout or long stolon-like rhizomes, partly reduced involucral leaves (bracteoles), epigeal germination, and polycolporate pollen grains. Within sect. Stolonifera s. str., we recognize two series as described by Juzepchuk (Stoloniferae or Flaccidae and Baicalenses). We believe they differ mainly by the presence or absence of basal scales and rosetteous leaves with distinct blades, and the time of their seasonal development, whether before or after anthesis.

According to Tamura, sect. Keiskea is monotypic and it is characterized by fleshy elongate rhizomes, one to few basal ternate leaves, sessile involucral leaves slightly connate at the base, solitary flowers with 5–

13 tepals, dilated filaments and few stalked compressed achenes with distinct styles. With Starodubtsev (1991), we believe that *A. keiskeana* is allied to *A. deltoidea*, but we regard this group of species as a section, not a separate genus. In our opinion, the both species belong to the diverse monotypic series which differs by the seasonal rhythms as noted above, shape of involucral leaves, and specific tepal and filament characteristics.

### Conspectus

**Anemone** L., Sp. Pl. 538 (1753).

Type: *A. coronaria* L.

Subgenus **Anemonanthea** (DC.) Juz., Fl. URSS 7: 241 (1937).

Type: *A. nemorosa* L.

Genus *Anemonoides* Mill., Gard. Dict. Abr. ed. 4. 28 (1754).

Genus *Anemonanthea* (DC.) S.F.Gray, Nat. Arr. Brit. Pl. 2: 724 (1821).

Sect. *Stephanomata* Spreng., Syst. Veg. 1: 660 (1825).

Rhizomes long, thin and short-nodulose, sometimes tuberous. Basal leaves with ternate blades or partly scale-like. Involucral leaves petiolate. Ovaries and achenes sessile, with distinct styles and small, mainly linear stigmas; basic chromosome number  $x = 8$ .

Sect. **Anemonanthea** DC., Syst. Nat. 1: 196 (1817).

Sect. *Sylvia* Gaudin, Fl. Helv. 3: 490 (1828), p. p.

Subsect. *Sylvia* (Gaudin) Ulbr. in Bot. Jahrb. 37: 187 (1906).

Sect. *Anemone* sensu Tamura in Sci. Rep. Osaka Univ. 16: 25 (1967), p. p., nom. nud.

Rhizomes monomorphic or dimorphic, but non tuberous. Basal leaves 2–3, scale-like, persistent; solitary leaves with distinct petioles and blades developing on rhizomes apart from flowering stems after anthesis. Cymes 1–few-flowered. Tepals 5–15, monomorphic or dimorphic. Pollen grains 3-colporate. Germination hypogea.

**Ser. Anemonanthea.**

Sect. *Hylalectron* Irmisch in Bot. Zeit. **14**: 19 (1856).

Ser. *Hylalectron* (Irmisch) Ulbr., l. c. (1906).

Subsect. *Hylalectron* (Irmisch ex Ulbr.) Juz., l. c. (1937).

Ser. *Nemorosae* Tamura, l. c. (1967), nom. nud.

Genus *Anemonoides* sect. *Anemonoides* Starod. p. p., subsectt. *Anemonoides*, *Ranunculoides* Starod., sect. *Umbrosa* Starod. in Bot. Zhurn. **74**: 1346 (1989).

Rhizomes monomorphic, long, 1–3 mm in diameter, branched, mainly prostrate. Leaflet petiolules mainly 1–3 mm, rarely 3–5 (–10) mm long. Involucral leaf petioles mainly 1–2 mm wide. Tepals 5–8 (rarely 9, 10), spreading, generally lacking vein anastomoses, pubescent or glabrous.

1. *A. nemorosa* L.

2. *A. amurensis* (Korsh.) Kom.

3. *A. caerulea* DC.

4. *A. uralensis* DC.

5. *A. ranunculoides* L.

6. *A. udensis* Trautv. & C.A.Mey.

7. *A. trifolia* L., var. *trifolia*, var. *albida* (Mariz) Ulbr., var. *brevidentata* Ubaldi & Puppi

8. *A. umbrosa* C.A.Mey.

9. *A. soyensis* Boiss.

10. *A. debilis* Fisch. ex Turcz.

Ser. *Altaicae* (Starod.) Ziman, Kadota & Bulakh, comb. et stat. nov.

Type: *A. altaica* Fisch. ex C.A.Mey.

Genus *Anemonoides* sect. *Anemonoides* p. p., subsect. *Altaicae* Starod., l. c. (1989).

Rhizomes dimorphic, short, thick (nodulose), and long, thin. Leaflet petiolules 2–5 (–10) mm long. Involucral leaf petioles mainly 3–5 mm wide. Tepals 8–15, with 3–5 vein anastomoses, glabrous.

11. *A. altaica* Fisch. ex C.A.Mey.

12. *A. pseudoaltaica* H.Hara var.

*pseudoaltaica* var. *gracilis* (H.Hara) H.Ohba  
var. *katonis* H.Ohba

13. *A. raddeana* Regel

Ser. **Nikoenses** Ziman, Kadota & Bulakh, ser. nov.

Type: *A. nikoensis* Maxim.

Sect. *Anemonanthea* DC., l. c. (1817), p. p.

Rhizomata dimorphica. Foliola in petiolatum 3–10 mm longa. Involucri folia in petiolum 3–5 mm lata. Perianthii tepala 5, anastomosi nervi 5–9, dense pilosa.

Rhizomes dimorphic. Leaflet petiolules 3–10 mm long. Involucral leaf petioles 3–5 mm wide. Tepals 5, with 5–9 vein anastomoses, densely puberulent.

14. *A. nikoensis* Maxim.

Ser. **Reflexae** Ulbr., l. c. 194 (1906).

Lectotype: *A. reflexa* Stephan ex Willd.

Subsect. *Reflexa* (Ulbr.) Juz., l. c. 250 (1937).

Genus *Anemonoides* sect. *Anemonoides* subsect. *Reflexae* (Ulbr.) Starod., Vetrynitsy: Syst. Evol. 123 (1991).

Rhizomes dimorphic. Leaflet petiolules 5–15 mm long. Involucral leaf petioles 1–2 mm wide. Tepals 5–7, without vein anastomoses, puberulent.

15. *A. reflexa* Stephan ex Willd.

Ser. **Quinquefoliae** Ziman, Kadota & Bulakh, ser. nov.

Type: *A. quinquefolia* L.

Sect. *Anemonanthea* subsect. *Hylalectron* (Irmisch) Juz., l. c. 241 (1937), p. p.

Genus *Anemonoides* sect. *Anemonoides* subsect. *Anemonoides* Starod., l. c. (1991).

Rhizomata dimorphica. Foliola in petiolatum 1–2 mm longa. Involucri folia in petiolum 1–2 mm lata. Perianthii tepala imprimis 5, anastomosi nervi imprimis nulla, glabra.

Rhizomes dimorphic. Leaflet petiolules 1–2 mm long. Involucral leaf petioles 1–2 mm

wide. Tepals mainly 5, without vein anastomoses, glabrous.

16. *A. quinquefolia* L. subsp. *quinquefolia*, subsp. *minima* (DC.) Frodin

17. *A. lancifolia* Pursh

18. *A. piperi* Britton ex Rydb.

19. *A. grayi* Behr & Kellogg subsp. *grayi*, susp. *lyallii* (Britton) B.E.Dutton & al.

20. *A. oregana* A.Gray

Sect. **Rosulantes** Ziman & Kadota, sect. nov.

Type: *A. stolonifera* Maxim.

Sect. *Anemonanthea* DC., l. c. (1817), p. p.

Genus *Anemonoides* sect. *Stolonifera* (Ulbr.) Starod., l. c. 122 (1991), p. p.

Rhizomata longa ramosa. Folia radicalia 2–5, evolvuntur ante anthesin, in petiolum in pars basalis gradatim dilatatus, basi residius petiolorum vestiti. Inflorescentia pauciflorae or flores solitarii. Tepala 5–7, monomorphic. Grana pollinis pantocolpata. Germinatio epigaea.

Rhizomes long, branched. Basal leaves 2–5, developing before anthesis. Basal leaf petioles basally gradually dilated, surrounded by fibrous remnants. Cymes 1–few-flowered. Tepals 5–7, monomorphic. Pollen grains pantocolpate. Germination epigeal.

### Ser. **Rosulantes**.

Sect. *Anemonanthea* DC., l. c. (1817), p. p.

Type: *A. stolonifera* Maxim.

Folia involucria in petiolum 1–3 cm longa, bracteola parva adsunt. Caula florifera 2–3. Inflorescentia pauciflorae. Tepala pilosa, anastomosi nervi adsunt ut nulla, staminodia adsunt.

Involucral leaf petioles 1–3 cm long; small bracteoles present. Scapes 2–3, few-flowered. Tepals puberulent, having or lacking vein anastomoses; staminodes present.

21. *A. stolonifera* Maxim.

22. *A. davidii* Franch.

Ser. **Exiguae** Ziman, Kadota & Bulakh, ser. nov.

Sect. *Anemonanthea* DC., l. c. (1817), p. p.

Type: *A. exigua* Maxim.

Folia involucria in petiolum 0.5–1.5 cm longa, bracteola nulla. Caula florifera solitaria, floris solitaria. Tepala subglabra, anastomosi nervi nulla, staminodia nulla.

Involucral leaf petioles 0.5–1.5 cm long; bracteoles absent. Scapes solitary, 1-flowered. Tepals subglabrous, lacking vein anastomoses; staminodes absent.

23. *A. griffithii* Hook.f. & Thoms.

24. *A. exigua* Maxim.

25. *A. scabriuscula* W.T.Wang

### Sect. **Tuberosa** Ulbr., l. c. (1906).

Genus *Anemonoides* sect. *Tuberosa* (Ulbr.) Starod. in Bot. Zhurn. **76**: 123 (1989).

Lectotype: *A. apennina* L.

Rhizomes tuberous. Basal leaves 1–3, developing before anthesis. Basal leaf petioles basally sharply dilated, scale-like. Cymes 1-flowered. Tepals 8–20, dimorphic. Pollen grains 3-colpate. Germination epigeal.

26. *A. apennina* L.

27. *A. blanda* Schott & Kotschy

28. *A. caucasica* Willd.

Subgen. **Stolonifera** (Ulbr. ex Juz.) Ziman, Kadota & Bulakh, stat. nov.

Subsect. *Stolonifera* Ulbr., l. c. (1905), p. p.

Sect. *Stolonifera* (Ulbr.) Juz., l. c. (1937).

Sect. *Keiskea* Tamura, l. c. (1967).

Lectotype: *A. baicalensis* Turcz. ex Ledeb.

Rhizomata longa aut brevita, non tuberifera. Folia involucria sessiles. Ovaria et achenia estipitata ut stipitata, stylodii conspicua ut vix visibles, stigmata imprimis subcapitata. Grana pollinis polycolpate. n = 7.

Rhizomes long or short, but non-tuberous. Involucral leaves sessile. Ovaries and

achenes sessile or stalked, with distinct or hardly recognizable styles and mainly capitate stigmas. Pollen grains polycolpate. Basic chromosome number  $x = 7$ .

### Sect. Stoloniferae.

Genus *Arsenjevia* Starod., l. c. (1989).

Lectotype: *A. baicalensis* Turcz. ex Ledeb.

Rhizomes short, stout and long, stolon-like. Involucral leaves several (part of them reduced). Cymes 1–3-flowered. Tepals 5–7. Ovaries and achenes sessile. Styles indistinct; stigmas mainly capitate.

#### Ser. Stoloniferae.

Ser. *Baicalenses* Juz., l. c. (1937).

Subsect. *Stolonifera* Ulbr., l. c. (1906), p.  
p.

Lectotype: *A. baicalensis* Turcz. ex Ledeb.

Scales-like basal leaves absent; basal leaves with distinct blades and basally vaginate petioles developing before anthesis. Carpel stigmas subcapitate, achene stigmas slightly dilated.

29. *A. baicalensis* Turcz. ex Ledeb., var. *baicalensis*, var. *kansuensis* (W.T.Wang) W.T.Wang, var. *saniculiformis* (C.Y.Wu) Ziman & B.E.Dutton, var. *litoralis* Litw., var. *glabrata* Maxim.

30. *A. prattii* Huth ex Ulbr.

Ser. *Flaccidae* Juz., l. c. (1937).

Subsect. *Stolonifera* Ulbr., l. c. (1906), p.  
p.

Lectotype: *A. flaccida* F.Schmidt

Scale-like basal leaves present; basal leaves with distinct blades and narrow petioles developing after anthesis. Carpel stigmas capitate or subcapitate, achene stigmas subcapitate or dilated.

31. *A. flaccida* F.Schmidt, var. *flaccida*, var. *hirtella* W.T. Wang, var. *hofengensis* (W.T.Wang) Ziman & B.E.Dutton, var. *anhuensis* (W.T.Wang) Ziman & B.E.Dutton

32. *A. delavayi* Franch., var. *delavayi*, var. *oligocarpa* (S.J.Pei) Ziman & B.E.Dutton

Sect. **Keiskea** Tamura emend. Ziman & Kadota.

Sect. *Anemonanthea* DC., l. c. (1817), p.  
p.

Subsect. *Sylvia* Gaudin, l. c. 193 (1905), p.  
p.

Genus *Tamuria* Starod., l. c. (1991).

Lectotype: *A. keiskeana* T.Ito ex Maxim.

Rhizomes long, branched. Involucral leaves 3, reduced. Cymes 1-flowered. Tepals 5–13. Ovaries and achenes stalked, covered with hairs 0.1–0.3 mm long; styles distinct; stigmas linear or slightly dilated. Pollen grains 3-colpate or polycolpate.

#### Ser. **Keiskea**.

Sect. **Keiskea** Tamura in Sci. Rep. Osaka Univ. **16**: 26 (1967).

Lectotype: *A. keiskeana* T.Ito ex Maxim.

Basal leaves several, 3-sected, with distinct petioles and blades, developing before anthesis. Involucral leaves 3-lobed. Tepals 10–22, linear-lanceolate, puberulent; ovaries and achenes compressed.

33. *A. keiskeana* T.Ito ex Maxim.

Ser. **Deltoidea** Ziman, Kadota & Bulakh, ser. nov.

Sect. *Anemonanthea* DC., l. c. (1817), p.  
p.

Type: *A. deltoidea* Hook.f. ex Douglas

Folia radicalia imprimis scariosa et solitaria e laminae evolvuntur ante anthesin. Involuci folia integerrima. Perianthii tepala 5, ovata, glabra; ovaria et achenia non compressa.

Basal leaves few, scale-like, persistent, and solitary, with distinct petioles and blades developing after anthesis. Involucral leaves undivided. Tepals 5, ovate, glabrous; ovaries and achenes not compressed.

34. *A. deltoidea* Hook.f. ex Douglas

### Key to the species of *Anemone* subgenus *Anemonanthea*

1a. Rhizomes long, thin and short nodulose,

- sometimes tuberous; involucral leaves petiolate; ovaries and achenes sessile, with distinct styles and mainly linear stigmas; basic chromosome number  $n = 8$  (subgen. *Anemonanthea*) ..... 2  
 1b. Rhizomes long or short, but non-tuberous; involucral leaves sessile; ovaries and achenes sessile or stalked, with distinct or hardly recognizable styles and mainly capitate stigmas; basic chromosome number  $n = 7$  (subgen. *Stolonifera*) ..... 29  
 2a. Basal leaves several, scale-like, persistent; solitary leaves with distinct blades and long petioles developing on rhizomes after anthesis; achene styles mainly 1–1.5 mm long (sect. *Anemonanthea*) ..... 3  
 2b. Basal leaves several, with distinct blades and long petioles developing on reproductive shoots before anthesis; achene styles mainly 0.5–0.7 mm long ..... 22  
 3a. Rhizomes monomorphic, long and 1–3 mm in diameter, branched, mainly horizontal; tepals 5–8 (rarely 9–10) (ser. *Anemonanthea*) ..... 4  
 3b. Rhizomes dimorphic, short, thick (nodulose) or long, thin; tepals 5–12 ..... 13  
 4a. Involucral leaf petioles 3–5 mm wide; carpel styles ca. 1 mm long; stigmas subcapitate or slightly dilated ..... 5  
 4b. Involucral leaf petioles 1–2 mm wide; carpel styles longer than 1 mm; stigmas linear ..... 8  
 5a. Involucral leaf petioles 1–3 cm long; involucral leaf blades similar to the basal leaf blades; cymes 1-flowered; tepals 5–8, glabrous; achene bodies (2–) 3–5 mm long ..... 6  
 5b. Involucral leaf petioles 3–5 mm long; involucral leaf blades larger than the basal leaf blades; cymes 1–2-flowered; tepals 5, pubescent, achene bodies 1–2 mm long ..... 7  
 6a. Central leaflets of basal leaf blades 3-lobed, ellipsoid-oblong, with wedge-like bases; tepals 6–10, mainly dimorphic, basally rounded, having 3–5 vein anastomoses; achene stigmas slightly dilated .....  
 ..... 1. *A. nemorosa*  
 6b. Central leaflets of basal leaf blades 3-sectored or 3-parted, rhombic, with semicordate bases; tepals 5–8, monomorphic, basally narrowed, lacking vein anastomoses; achene stigmas sublinear ..... 2. *A. amurensis*  
 7a. Tepals basally narrowed, mainly blue or whitish, densely puberulent; filaments dilated basally ..... 3. *A. caerulea*  
 7b. Tepals basally rounded, mainly rose or red, sparsely puberulent; filaments dilated apically ..... 4. *A. uralensis*  
 8a. Cymes 1–few-flowered; tepals pubescent, usually with vein anastomoses; achenes slightly compressed, with lateral ribs ..... 9  
 8b. Cymes 1-flowered; tepals glabrous or subglabrous, lacking vein anastomoses; achenes compressed or not compressed ..... 11  
 9a. Basal and involucral leaflets 2–3-lobed (sometimes parted); involucral leaf petioles 3–5 cm long; tepals dimorphic, basally narrowed; achene styles 0.8–1.5 mm long .....  
 ..... 5. *A. ranunculoides*  
 9b. Basal and involucral leaflets undivided; involucral leaf petioles 1–3 cm long; tepals monomorphic, basally rounded; achene styles 1.5–2.5 mm long ..... 10  
 10a. Cymes 1-flowered; tepals 5, mainly pilose, having 5–9 vein anastomoses .....  
 ..... 6. *A. udensis*  
 10b. Cymes few-flowered; tepals 5–8, glabrous, having solitary vein anastomoses...  
 ..... 7. *A. trifolia*  
 11a. Central segments of basal leaf blades 3-lobed; tepals 5; achene hairs 0.2–0.3 mm long ..... 8. *A. umbrosa*  
 11b. Central segments of basal leaf blades serrate or coarsely toothed; tepals 5–7; achene hairs ca. 0.01 mm long ..... 12  
 12a. Tepals 10–15 mm long, basally rounded, white; achenes not compressed, without ribs, 4–5 mm long, sparsely puberulent ..... 9. *A. soyensis*  
 12b. Tepals 4–8 mm long, basally narrowed, white-greenish; achenes slightly compressed, with narrow ribs, 2–4 mm long, densely

- puberulent ..... 10. *A. debilis*  
 13a. Tepals 8–15, glabrous, spreading; cymes 1-flowered (ser. Altaicae) ..... 14  
 13b. Tepals 5–8, glabrous or pubescent, spreading or bent; cymes 1–few-flowered ....  
 ..... 16  
 14a. Basal leaf petiolules 5–10 mm long; tepals dimorphic; filaments filiform; ovaries and achenes basally narrowed, with narrow lateral ribs; achene hairs 0.1–0.3 mm long; achene styles puberulent; carpel stigmas subcapitate; achene stigmas slightly dilated...  
 ..... 11. *A. altaica*  
 14b. Basal leaf petiolules 2–5 mm long; tepals monomorphic; filaments basally dilated; ovaries and achenes basally narrowed or rounded, with ribs or lacking them; achene hairs 0.2–0.5 mm long; achene styles glabrous; carpel and achene stigmas linear or sublinear ..... 15  
 15a. Basal and involucral leaflets deeply 3-lobed; involucral leaf petioles 10–20 × 3–5 mm, distinctly dilated; tepals 8–12, having 3–5 veins anastomoses; achenes basally rounded, not compressed, styles 0.5–1 mm long ..... 12. *A. pseudoaltaica*  
 15b. Basal and involucral leaflets medially 3-lobed or toothed; involucral leaf petioles 5–12 × 1–2 mm, basally slightly dilated; tepals 9–15, having 1–3 veins anastomoses; achenes basally narrowed, slightly compressed, styles 1–1.5 mm long .....  
 ..... 13. *A. raddeana*  
 16a. Involucral leaf petioles 3–5 mm wide; tepals 5 (–6), spreading, with narrow bases and apices, 15–30 mm long, having 5–9 veins anastomoses, sparsely puberulent; achenes densely puberulent (ser. Nikoenses)  
 ..... 14. *A. nikoensis*  
 16b. Involucral leaf petioles 1–2 mm wide; tepals 5–7, spreading or bent, with rounded bases and apices, 5–20 mm long, mainly without vein anastomoses, subglabrous; achenes sparsely puberulent ..... 17  
 17a. Cymes few-flowered; bracteoles present; tepals 5–7 × 1–2 mm, bent, sparsely puberulent; achene hairs less than 0.1 mm long (ser. Reflexae) ..... 15. *A. reflexa*  
 17b. Cymes 1-flowered; bracteoles absent; tepals 10–25 × 4–10 mm, spreading, glabrous; achene hairs 0.1–2 mm long (ser. Quinquefoliae) ..... 18  
 18a. Tepals 5, having solitary vein anastomoses; involucral leaf petioles 0.5–2 cm long, achene styles sparsely puberulent...  
 ..... 19  
 18b. Tepals 5–7, lacking vein anastomoses; involucral leaf petioles 1–3 cm long; achene styles glabrous ..... 20  
 19a. Lateral leaflets often deeply two-lobed; basal leaf blades puberulent; involucral leaf blades and stems puberulent or subglabrous; filaments filiform; ovaries and achenes covered with hairs 0.5–1 mm long .....  
 ..... 16. *A. quinquefolia*  
 19b. Lateral leaflets all lanceolate, undivided; leaves and stems glabrous; filaments basally dilated; ovaries and achenes covered with hairs 0.1–0.2 mm long .....  
 ..... 17. *A. lancifolia*  
 20a. Scapes few, puberulent; rhizomes mainly vertical; ovaries and achenes densely covered with hairs 1–2 mm long .....  
 ..... 18. *A. piperi*  
 20b. Stems solitary, glabrous; rhizomes horizontal or ascending; ovaries and achene bodies covered with hairs 0.1–0.2 mm long... 21  
 21a. Tepals 7–10 × 4–6 mm, mainly white or blue; achenes basally narrowed, slightly compressed, with narrow lateral ribs .....  
 ..... 19. *A. grayi*  
 21b. Tepals 10–20 × 5–10 mm, red to blue; achenes basally rounded, not compressed, without ribs ..... 20. *A. oregana*  
 22a. Rhizomes non-tuberous; basal leaf petioles basally gradually dilated; cymes 1–few-flowered, tepals 5; achenes ovoid, subglabrous or glabrous (sect. Rosulantes) ...  
 ..... 23  
 22b. Rhizomes tuberous; basal leaf petioles basally sharply dilated, scale-like; cymes 1-flowered; tepals 8–12; achenes ellipsoid,

- sparingly puberulent (sect. *Tuberosa*).....27  
 23a. Scapes 2–3, few-flowered; involucral leaf petioles 1–3 cm long; bracteoles present, small; tepals puberulent, with or without vein anastomoses; staminodes present; achenes not compressed, without ribs (ser. *Rosulantes*) .....24  
 23b. Scapes solitary, 1-flowered; involucral leaf petioles 0.5–1.5 cm long; bracteoles absent; tepals subglabrous, lacking vein anastomoses; staminodes absent; achenes slightly compressed, with narrow ribs (ser. *Exiguæ*) .....25  
 24a. Tepals 5–10 mm long, lacking vein anastomoses; staminodes between tepals and stamens; stigmas linear .....21. *A. stolonifera*  
 24b. Tepals 15–20 mm long, having 5–15 veins anastomoses; staminodes between stamens and carpels; stigmas subcapitate .....22. *A. davidii*  
 25a. Involucral leaf petioles 3–5 mm wide, basally connate; ovaries and achenes sparsely puberulent .....23. *A. exigua*  
 25b. Involucral leaf petioles 1–2 mm wide, free; ovaries and achenes glabrous .....26  
 26a. Involucral leaf blades ternate, larger than those in basal leaves; styles nearly absent; stigmas subglobose .....24. *A. griffithii*  
 26b. Involucral leaf blades 3-sected, smaller than those in basal leaves; styles distinct; stigmas linear .....25. *A. scabriuscula*  
 27a. Rhizomes cylindroid; basal leaf petioles 10–20 cm long, involucral petioles 1.5–3 cm long; tepals 12–14, 15–20 mm long; achenes 3.2–3.6 mm long, its ribs ca. 0.2 mm or absent; stigmas linear .....28  
 27b. Rhizomes subspherical; basal leaf petioles 5–8 cm long, involucral petioles 0.5–1.5 cm long; tepals 8–10, 8–10 mm long; achenes 2–2.2 mm long, with ribs ca. 0.5 mm and slightly curved styles; stigmas dilated .....28. *A. caucasica*  
 28a. Basal leaf blades ternate, with petiolules 3–5 mm long; tepals of outer circle with 1–3 vein anastomoses; filaments basally dilated; carpels and achenes without lateral  
 ribs, scarcely pubescent .....26. *A. apennina*  
 28b. Basal leaf blades 3-sected, with petiolules 1–2 mm long (frequently absent); tepals of outer circle with 5–9 veins anastomoses; filaments linear; carpels and achenes with lateral ribs and pubescent only at the base .....27. *A. blanda*  
 29a. Involucral leaves several (several reduced); cymes 1–3-flowered; tepals 5–7; achenes sessile; styles hardly recognizable; stigmas dilated or subcapitate (sect. *Stolonifera*) .....30  
 29b. Involucral leaves 3, all reduced; flowers solitary; tepals 5–13; achenes stalked, styles distinct, stigmas linear (sect. *Keiskea*) .....33  
 30a. Scale-like basal leaves absent; basal leaves with distinct blades and basally vaginate petioles developing before anthesis; carpel stigmas subcapitate, achene stigmas slightly dilated (ser. *Stoloniferae*) .....31  
 30b. Scale-like basal leaves present; basal leaves with distinct blades and narrow petioles developing after anthesis; carpel stigmas capitate or subcapitate, achene stigmas subcapitate or dilated (ser. *Flaccidae*) .....32  
 31a. Rhizomes short, 8–10 mm in diameter, with long underground stolons; tepals 10–15 mm long, with 3–5 veins anastomoses; achene bodies basally narrowed, slightly compressed, with narrow ribs .....29. *A. baicalensis*  
 31b. Rhizomes short, 5–7 mm in diameter, with long above-ground stolons; tepals 8–10 mm long, without vein anastomoses; achene bodies basally rounded, not compressed, without ribs .....30. *A. prattii*  
 32a. Basal leaves having blades 2–4; scapes 1–3, cymes few-flowered; bracteoles present; tepals 5–10 mm long, with 7–9 veins anastomoses; achenes sparsely puberulent or glabrate, hairs 0.1 mm long...31. *A. flaccida*  
 32b. Basal leaves having blades solitary; scapes solitary, cymes 1-flowered; bracteoles absent; tepals 7–15 mm long, lacking vein anastomoses; achenes densely puberulent, hairs ca. 0.5 mm long .....32. *A. delavayi*

- 33a. Rhizomes 1–2 mm in diameter; tepals 10–22, linear-lanceolate, having few veins anastomoses, basally sparsely puberulent; achene stalks 1.5–2 mm long, achene bodies long-ovovate, sparsely puberulent, stigmas linear-lanceolate (ser. Keiskea) .....  
..... 33. *A. keiskeana*  
 33b. Rhizomes 2–5 mm in diameter; tepals 5, elliptic, without vein anastomoses, glabrous; achene stalks 0.5–0.7 mm long, achene bodies subglobose, hispid proximally, stigmas triangular-subulate (ser. Deltoidea) ..... 34. *A. deltoidea*

### Taxonomic analysis

Characteristics of all taxa are given below, followed by a discussion of their interrelationships. We excluded from the descriptions [except the first one within the each subgroup (section or series)] the characters in common to all taxa, viz., the characteristics of the scale-like basal leaves, whether distinct basal leaf blades develop after anthesis, the 3 involucral leaves, monomorphic tepals, rounded apices of anthers ca. 1 mm long, conic glabrous carpel and achene styles, subglobose achene heads ca. 1 cm in diameter, neither do we mention the various types (holo-, lecto- and others), if they are not designated.

#### Subgen. I. *Anemonanthea*.

##### Sect. I. *Anemonanthea* DC.

###### Ser. 1. *Anemonanthea*.

1. ***Anemone nemorosa* L.**, Sp. Pl. 541 (1753).

**TYPES:** “Fl. suec. 450. Ranunculus sylvarum. Habitat in Europaea asperis, duris, nemoribus”. N 710.15 (lectotype designated here—LINN!). “W Europe: Herb. Clifford 224, Anemone 3, Ranunculus phragmites albis” (BM!).

*Anemone nemorosa-alba* Crantz, Stirp. Austr. Fasc. 1–2: 101 (1762).

*Anemone alba* Gilib., Fl. Lith. 2: 275 (1782).

*Anemone nemorosa* L. subsp. *europaea* Ulbr. in Bot. Jahrb. 37: 225 (1906).

*Anemone nemorosa* L. subsp. *typica* Korsh. in Fl. Vost. Evr. Ross. 1: 59 (1892).

*Anemone nemorosa* L. var. *purpurea* et var. *rosea* DC., Prodr. 1: 20 (1824).

*Anemone nemorosa* L. var. *coerulea* Pritz. in Linnaea 15: 652 (1841). Syntype: “Prope Dachland ad Rhenum”, Zeyher M.

*Anemone nemorosa* L. var. *hirsuta* Wierzbicki ex Pritz., l. c. (1841). Type: “Mons Magdalenae prope Brixiam Italiae”, Bracht.

*Anemone nemorosa* L. var. *parviflora* Schlechtd. ex Pritz., l. c. (1841).

*Anemone nemorosa* L. var. *rubra* Pritz., l. c. (1841).

*Anemone nemorosa* L. var. *semiplena* Pritz., l. c. (1841).

*Anemone nemorosa* L. var. *sulphurea* Pritz., l. c. (1841).

*Anemone nemorosa* L. var. *latiloba* J. Kickx f. in Bull. Soc. Roy. Bot. Belg. 4: 204 (1865).

*Anemone nemorosa* L. var. *anandra* Hua in Bull. Soc. Bot. Fr. 26: 255 (1889).

*Anemone nemorosa* L. var. *bastardii* Rouy & Foucaud, Fl. Fr. 1: 44 (1893).

*Anemone nemorosa* L. var. *grandiflora* Rouy & Foucaud, l. c. (1893).

*Anemone nemorosa* L. var. *tenuiflora* Rouy & Foucaud, l. c. (1893).

*Anemone nemorosa* L. var. *bracteata* Hegi in Ill. Fl. Mittel. Eur. 3: 524 (1912).

*Anemone nemorosa* L. var. *monoica* Hegi, l. c. (1912).

*Anemone nemorosa* L. var. *cyanopsis* Lagerh. in Svensk Bot. “insula Varmdo prope Stockholmiam, 1896, Netzel Suniv”.

*Anemone nemorosa* L. var. *apetala* Salisb. in Ann. Bot. (Oxford) 30: 528 (1916). Holotype: “Great Britain. Oak-Hornbeam woods of Hertfordshire”, Worsdell (K!).

*Anemone nemorosa* L. var. *robusta* Salisb., l. c. (1916).

*Anemone nemorosa* L. f. *biflora* Peterm.,

Fl. Lips. 407 (1838).

*Anemone nemorosa* L. f. *latisecta* Schur, f. *subumbellata* Schur in Enum. Pl. Transs. 4 (1866).

*Anemone nemorosa* L. f. *latifolia* Ulbr. in Bot. Jahrb. 37: 215 (1906).

*Anemonoides nemorosa* (L.) Holub in Folia Geobot. Phytotax. Praha 8: 166 (1973).

Rhizomes prostrate or ascending, 3–5 mm in diameter, long and branched. Basal leaves 2–3, scale-like ( $4\text{--}6 \times 5\text{--}7$  mm), solitary with distinct blades developing after anthesis; petioles 5–20 cm long, glabrous or sparsely puberulent; blades ternate, pentagonal, 2–6  $\times$  2–5 cm, glabrous or sparsely puberulent along veins; petiolules 3–5 mm long; central leaflets 3-lobed, ellipsoid-oblong; bases wedge-like; margins serrate and incised, apices acuminate; lateral leaflets deeply 2-lobed, ovate to slightly deltoid, having serrate-incised margins. Scapes 5–20 ( $-30$ ) cm long, glabrous or pilose; cymes 1-flowered. Involucral leaves 3; petioles flat and dilated, 1–3 cm  $\times$  3–5 mm, glabrous or sparsely pubescent; blades ternate, similar to those in basal leaves, 2–5  $\times$  2–5 cm, sparsely puberulent along veins; petiolules 2–5 mm long; central leaflets 3-lobed; lateral leaflets deeply 2-lobed or 2-parted (Fig. 1A). Pedicels 2–6 ( $-9$ ) cm long, pilose. Tepals 6–10, oblong-ovate, white or tinged red to blue, rose or pink, glabrous, often dimorphic: outer tepals 10–20  $\times$  5–10 mm, with 5–9 basal veins and 3–5 vein anastomoses; inner tepals 8–12  $\times$  3–6 cm, with 4–5 basal veins and solitary vein anastomoses. Stamens 4–8 mm long; filaments mainly filiform, but sometimes basally dilated; anthers oblong-ellipsoid, with rounded apices and wide connectives, ca. 1 mm long. Ovaries ovoid, 0.7–1.5 mm long, densely puberulent (hairs 0.1–0.2 mm long); styles conic, almost straight, 0.5–0.8 mm long; stigmas slightly dilated (Fig. 2A). Achene bodies ovoid to ellipsoid, 3.5–5  $\times$  1.5–2.5 mm, slightly compressed, with narrow lateral ribs (0.1–0.2 mm wide),

densely puberulent (hairs 0.1–0.2 mm long); styles apically curved, 0.5–1.2 mm long, sparsely puberulent or glabrous; stigmas slightly dilated (Fig. 3A).

Chromosome number: n = 15, 16 (Baumberger 1970).

Distribution: Europe (most countries including Great Britain, Germany, Austria, Italy, Poland, Ukraine, etc.); occurring in forests and under bushes, but sometimes in open sites, alt. 300–1500 m.

Specimens examined: **UKRAINE**; Kiev Reg., Boyarka, 12.4.1915, Semenkewich (KW); Nemeshaev, 7.4.1916, Semenkewich (KW); near Syrets, 23.4.1922, Semenkewich (KW); Klavdiev, 18.4.1927, Semenkewich (KW); Trubetska, 1.5.1924, Lazarenko (KW); Feofania, 10.5.1998, Ziman & Bulakh (KW); Kiev, near National Botanical Garden, 20.4.1999, Bulakh (KW); Zhitomir Reg., Ovruch Distr., Kolesnyki, 12.4.1971, Barbarich (KW); Olevski Distr., Sushchyni, 25.5.1948, Dobrochaeva (KW); Khmelnitski Reg., Chemeroverts Distr., Karachkovtsy, 18.4.1968, Morozyuk (KW); Lviv Reg., Turka Distr., Ratsyni, 5.5.1985, Krysj (KW); Rivne Reg., Verbetsky Distr., Dubki, 26.4.1954, Kotov (KW); Winnitsa Reg., Pyatnichany, 24.4.1939, Grynj (KW); Ternopil Reg., Bozha Mt. near Kremenets, 10.6.1998, Ziman (KW); Chernivtsi Reg., Vyzhniatski Distr., Lopushno, 11.4.1961, Solodkova (KW); Ivano-Frankovsk Reg., Pereginski Distr., Osmoloda, 25.4.1941, Grynj (KW); near Vorokhta, Mt. Pozhizhewska, 30.6.1997, Ziman & Dutton (KW); Transcarpathia Reg.: Rakhiv Distr., Bogdan, Mt. Goverla, 1.7.1948, Bylyk (KW); Jasinja, Mt. Bliznitsa, summit, 1800 m, 28.6.1997, Ziman & Dutton (KW); Svaljava Distr., close Poljana, 30.5.1998, Ziman (KW). **HUNGARY**; Gomor, Tiszolcz, Furmaniecz vogy, 25.5.1900, Richter (CLUJ); Kristians Mt., Nysaeter, 8.6.1907, Fridtz (CLUJ). **ROMANIA**; Muntenia Mts., Bucegi, 1500 m, 6.8.1938, Nyarady (CLUJ); Muntenia Distr., Prahova, Galma, prope pagum Busteni, 950 m, 28.4.1940, Cretzoiu (MHA); Oltenia, Vilcea Distr., Govora, 500 m, 17.4.1967, Popescu (MHA); Satu Mare, 4.4.1976, Pop (CLUJ); Sibiu, Talmacin Suvara, 410 m, 11.4.1980, Dragulescu (CLUJ). **POLAND**; Gdajn Distr., Dulowa Chrzanow, 29.4.1952, Novak (MHA); Baby Dol, near Mukovo, 17.6.1978, Matsenko (MHA). **CZECHIA**; Silesia, Slask Dolny, Brzeznica pow., Zabkowice, 20.4.1952, Borzeta (MHA); Bohemia, Kunratice, 3.5.1958, Nitka (MHA). **GERMANY**; N Schwielow-See, Mark, 10.5.1924, Laubert 1031 (MHA); Dollerupholz, Gluksburg, 14.5.1970, Larsen

(CLUJ); Halle-Saale, Petersberg, 22.4.1980, Skwortsow (MHA); Harz-Gebirge, Harzgerode, 29.4.1980, Skwortsow (MHA). DENMARK; Yutlandia, prope Tjele, 18.4.1969, Skwortsow (MHA); Zealand, Grib Skov, Kagerup, 15.5.1970, Fredtoft & Jacobsen (MHA). FINLAND; S Tavastia, Tyrvanto, Lepaa, 8.5.1959, Pankakoski (MHA). GREAT BRITAIN; Berkshire, Reading, Whiteknights, Wilderness, 24.4.1978, Souster (MHA). ITALY; Prov. Riet, Lazio, Mt. Terminillo, 1300 m, 19.5.1987, Zucconi et al. (MHA). SPAIN; Prov. Leon, Cordillera Cantabrica, Pinar de Lillo, 1550 m, 3.6.1980, Losa Quintana (MHA).

According to Juzepchuk (1937), Chater (1973), Pignatti (1988) and others, the most important characters of *A. nemorosa* are the ternate basal and involucral leaves, solitary flowers with 5–7 glabrous tepals and oblong achenes with curved styles.

From the time of De Candolle (1817) and Pritzel (1841), *A. nemorosa* was regarded as a variable taxon which included several subspecies and varieties (e.g., var. *rubra* Pritz., var. *grandiflora* Rouy & Foucaud, var. *bracteata* Hegi). Most of these varieties were described on the basis of tepal size and colour and other variable characters. Therefore, we confirm the opinion of Dutton (1996) who noted the continuous nature of the character variation throughout the range of this species which makes recognition of infraspecific entities unwarranted.

**2. *Anemone amurensis* (Korsh.) Kom. in Tr. Imp. St.-Peterburgsk. Bot. Sada **22**: 262 (1903).**

**TYPES:** RUSSIA: "In sylvis frondosis ad ostium Ussuri prope Kazakewiczewa", 15.5.1891, Korzhinski (lectotype—LE!; isotype—GH!).

*Anemone nemorosa* L. subsp. *amurensis* Korsh. in Tr. Imp. St.-Peterburgsk. Bot. Sada **12**: 293 (1892).

*Anemone nemorosa* L. var. *kamtschatica* Kom., Fl. Pen. Kamtsch. **2**: 129 (1929).

*Anemone nemorosa* L. subsp. *kamtschatica* (Kom.) Starod. in Bot. Zhurn. **68**: 1015 (1983).

*Anemone nemorosa* L. var. *fissa* Ulbr. in Bot. Jahrb. **37**: 226, 1906. Type: CHINA: "Sudostmandschurei: am oberen Ussuri", 1860, Maximowicz (LE!).

*Anemonoides amurensis* (Korsh.) Holub in Folia Geobot. Phytotax. Praha **8**: 165 (1973).

Rhizomes prostrate or ascending, 3–10 cm × 1–3 mm, long, branched. Basal leaves 2–3, scale-like, and solitary, with distinct blades, developing after anthesis; petioles 7–15 (–20) cm long, basally slightly dilated, sparsely pilose or subglabrous; blades 1- or 2-ternate, pentagonal, 3–3.5 × 5–6 cm, abaxially glabrous, adaxially sparsely puberulent; petiolules 5–10 (–15) mm long; central leaflets 3-sected or 3-parted, rhombic to broadly ovate; bases subcordate to cuneate; margins crenate or dentate; apices acuminate to obtuse; lateral leaflets similar to central leaflet, rhombic to obovate, but oblique; central segments deeply 3-lobed, rhombic, lateral segments usually 2-cleft. Scapes (5–) 10–25 cm long, glabrous; cymes 1-flowered. Involucral leaf petioles 1–1.5 cm × 3–5 mm, dilated and narrowly winged, pilose; blades ternate, ovate to pentagonal, 2.5–4 × 2.5–4 cm, subglabrous or adaxially sparsely puberulent; petiolules 2–5 mm long; central leaflets subpinnately parted, ovate-rhombic; bases cuneate; margins serrate; apices acuminate; lateral leaflets 2-parted, ovate to lanceolate (Fig. 1B). Pedicels 1.5–5 cm long, puberulent. Tepals 5–8, monomorphic, obovate to oblong, with long-narrow bases and rounded apices, white, 10–15 (–18) × 5–7 (–10) mm, glabrous; basal veins 3–5, vein anastomoses solitary. Stamens 4–7 mm long; filaments filiform or sometimes slightly dilated basally and apically; anthers ellipsoid, connectives wide. Ovaries cylindroid, 2–2.5 mm long, densely puberulent, hairs ca. 0.2 mm long; styles straight, 0.8–1 mm long; stigmas subcapitate (Fig. 2B). Achene bodies narrowly ovoid, 4–5 × 1.5–2 mm, densely puberulent (hairs 0.1–0.2 mm long); styles slightly curved, 0.5–1 mm long, glabrous;

stigmas sublinear.

Chromosome number:  $n = 24$  (Starodubtsev 1982, Nishikawa 1997).

Distribution: NE Asia: Russia (Far East, Kamchatka), NE China (Jilin, Heilongjiang, Liaoning), N Japan (Hokkaido), N Korea; occurring in forests or under bushes, mainly in mountain regions.

Specimens examined: RUSSIA; Far East, Primorje, near Vladivostok, 26.4.1902, Palczewski (KW); 26.3.1906, Palczewski (LE); 3.5.1910, Kuznetsov (LE); 17.5.1910, Kuznetsov (KW); 4.5.1970, Gorovoy (MHA; KW); 5.5.1980, Starodubtsev (MHA); Shkotovski Distr., Zmeinka, 9.5.1973, Kostenko (VLA); Tygrovyi, 29.4.1980, Starodubtsev (MHA); Ussuri Reserve, Maikhinski Kluch, 14.5.1973, Kostenko (VLA); 3.5.1974, Kharkewitch & Buch (MHA); Khabarovski Reg., Khasanski Distr., Furugelma Isl., 5.1975, Zdorovjeva (MHA); Kedrovaya, 9.5.1980, Starodubtsev (MHA); Iljinski Distr., near Evgenievka, Khanka Lake, 31.3.1911, Cherski (LE); near Tatarski Strait, 5.1912, Derbek (LE); Chuguev Distr., Sokolovka, 19.5.1980, Starodubtsev (MHA); close Krasnorechensk, 2.5.1983, Shestera (MHA); Kamchatka, Abachinska guba, Tarvinska Bay, 7.6.1908, Komarov (LE). JAPAN; Hokkaido, Tokachi Prov., Urahoro, 21.4.1985, Nishikawa (TNS).

Korzhinski (1892) initially described this species as a subspecies under *A. nemorosa* (as subsp. *amurensis*). However, Komarov (1903) regarded it as a distinct species (*A. amurensis*) because of its wide-dilated involucral leaf petioles. Juzepchuk (1937) also noted its longer basal leaf petiolules, smaller flowers, and longer stamens.

In this treatment *A. amurensis* differs from *A. nemorosa* mainly by shape of the basal leaf leaflets (3-sected or 3-parted, rhombic, with subcordate bases) and monomorphic tepals lacking vein anastomoses but with long-narrow bases. However, both taxa (not only *A. amurensis*) are characterized by dilated involucral leaf petioles and glabrous tepals of a similar size.

### 3. *Anemone caerulea* DC., Syst. Nat. 1: 203 (1817).

TYPES: "In Siberia circa Zmeof,", Patrin

(holotype—G). Isotypes: "In montibus altaicus frequenter in pratis humidis montosis et ad nives deliquescentes,", Ledebour & Bunge. "In pratis ad rivulum Urmuchaika prope Buchtarminsk,", Meyer (paratypes—LE!).

*Anemone fisheriana* DC., Prodr. 1: 20 (1824). RUSSIA: "In Siberia, prope Salair,", Fischer (holotype—LE!).

*Anemone incisa* Ledeb., Ind. Sem. Hort. Dorp. (1824).

*Anemone ranunculoides* L subsp. *caerulea* (DC.) Korsh., Fl. Vost. Evr. Ross. 54 (1892).

*Anemone caerulea* DC. subsp. *typica* Ulbr. in Bot. Jahrb. 37: 217 (1906).

*Anemonoides caerulea* (DC.) Holub in Folia Geobot. Phytotax. Praha 8: 166 (1973).

*Anemonoides fischeriana* (DC.) Holub, l. c. (1973).

Rhizomes prostrate, long, branching, 2–4 mm in diameter. Basal leaves 2–3, scale-like, and solitary, with distinct blades; petioles 8–12 (–15) cm long, glabrous; blades 3-sected, rhombic-pentagonal, 2–4 × 3–4 cm, glabrous; petiolules 1–2 mm long; central segments narrowly oblong, undivided or 3-lobed; bases narrowly cuneate; margins serrate; apices long-acuminate; lateral segments 2-parted, oblique, with 4–10 lacerate lobes. Scapes 15–25 (–35) cm long, glabrous; cymes few-flowered. Involucral leaf petioles 3–10 × 3–5 mm, sparsely puberulent or glabrate; blades 3-sected, larger than the basal leaf blades, 4–6 × 5–6 cm, pilose beneath; segments subsessile; central segments oblong or linear-lanceolate; bases narrowly cuneate; margins coarsely serrate or incised-dentate, 3–5 long-acute teeth distally, falcate; apices acuminate; lateral segments 2-parted, having several acute teeth (Fig. 1C). Pedicels 1–2 (–5) cm long, appressed- or erect-spreading-villous. Tepals 5 (–6), obovate-elliptic, with narrow bases and wide apices, mainly blue or rarely whitish, 6–10 × 4–7 mm, appressed-pilose; basal veins 5–7, vein anastomoses solitary. Stamens 3–

5 mm long; filaments basally dilated; anthers ellipsoid, connectives wide. Ovaries ovoid-ellipsoid, basally and apically narrowed, densely puberulent, hairs 0.1–0.2 mm long; styles uncinate, 0.7–1 mm long; stigmas slightly dilated (Fig. 2C). Achene bodies ovoid-ellipsoid, 1–1.5 × 1–1.5 mm, densely puberulent (hairs ca. 0.2 mm long); styles straight or curved, 1–1.5 mm long, glabrous; stigmas sublinear.

Chromosome number:  $n = 8$  (Baumberger 1970, Kartashowa et al. 1974).

Distribution: NE Asia: Russia (Siberia); occurring in forests and their margins, scrubs, and occasionally in meadows.

Specimens examined: RUSSIA; Tomsk, 9.5.1903, Nekrasova (KW); near Tomsk, 2.5.1923, Krylov (KW); Tomsk Distr., Basandajka, 17.6.1925, Sergievskaya (KW); Tomsk Reg., 11.5.1939, Bashmakova (KW); Novosibirsk Reg., Maslyaninski Distr, Otschikha, 21.5.1967, Krasnoborov (KW).

*Anemone caerulea* was described by De Candolle (1817), and, according to the author's description, its plants have ternate long-petiolate basal leaves, involucral leaves with short petioles, 5 elliptic tepals, and ovoid sessile achenes.

However, Korzhinski (1892) regarded this taxon as a subspecies of *A. ranunculoides*, or in the case of Ulbrich (1906), a species very close to it. Ulbrich regarded both of them as "species collectiva". Korzhinski (1892) and Ulbrich (1906) both noted the cylindric shape of the rhizomes, the long-acuminate terminal leaf lobes, 1–2-flowered glabrous stems, and the rose or blue tepals. Nevertheless, the view that *A. caerulea* is a species allied to *A. ranunculoides* did not change.

According to our data, *A. caerulea* is quite close to *A. ranunculoides* (short involucral leaf petioles and leaflet petiolules, few-flowered cymes, pubescent tepals with vein anastomoses). In our opinion, however, it is closest to *A. uralensis* (differs only by the tepal shape, colour and hairiness, and filament shape).

Candolle (1824) also described *A. fischeriana* a closely related species, but which later was included in *A. caerulea*. We confirm that the distinctions of *A. fischeriana* from *A. caerulea* are too slight to warrant recognizing *A. fischeriana* as a distinct species.

#### 4. *Anemone uralensis* Fisch. ex DC., Prodr. 1: 19 (1824).

TYPE: "In montibus Uralensibus", Fischer (holotype—G).

*Anemone ranunculoides* L. subsp. *uralensis* (DC.) Korsh., Fl. Vost. Evr. Ross. 1: 57 (1892).

*Anemone caerulea* DC. var. *uralensis* (DC.) Korsh., Tent. Fl. Ross. Orient. 6 (1898).

*Anemone caerulea* DC. var. *uralensis* (DC.) Ulbr. in Bot. Jahrb. 37: 266 (1906). RUSSIA: "S Ural, im Ufa bei Zlatoust, in Perm bei Krassnoufimsk, an der Tchusovaya", Georgi 1773 (lectotype—LE!).

*Anemonoides uralensis* (DC.) Holub in Folia Geobot. Phytotax. Praha 8: 166 (1973).

Rhizomes prostrate, long, branching, 2–4 mm in diameter. Basal leaves 2–3, scale-like, and solitary, with distinct blades; petioles 7–15 cm long, glabrous; blades 3-sected, 2–4 × 2–4 cm, glabrous; petiolules 1–2 mm long; central segments ovate to rhombic, with 2–4 lacerate lobes; bases narrow-lanceolate; margins serrate; apices acuminate; lateral segments similar to central ones, lanceolate, with 4–8 lacerate lobes. Scapes 8–20 cm long, glabrous; cymes 1–2-flowered. Involucral leaf petioles 3–5 × 3–5 mm, glabrous or puberulent; blades 3-sected, larger than those in basal leaves, 3.5–6 × 3–5 cm; petiolules 1–2 mm long; central segments narrow-elliptic; bases cuneate; margins serrate, with 4–9 teeth; apices acuminate; lateral segments similar to central ones. Pedicels 2–5 cm long, pilose or villous. Tepals 5 (–6), obovate-elliptic, with wide bases and apices, mainly rose or red, some-

times yellow, blue or white, 6–12 × 4–7 mm, puberulent proximally or medially; basal veins 5–7, vein anastomoses 3–5. Stamens 2–5 mm long; filaments apically dilated; anthers ellipsoid, connectives wide (sometimes stamens lacking anthers). Ovaries ovoid, 0.7–1 mm long, densely puberulent, hairs 0.01–0.05 mm long; styles slightly curved, 0.6–1 mm long; stigmas slightly dilated (Fig. 2D). Achene bodies subglobose, 1–1.5 × 0.5–1.5 mm, densely puberulent (hairs less than 0.1 mm long); styles recurved, ca. 1 mm long, glabrous; stigmas sublinear.

Chromosome number:  $n = 16$  (Chupov 1975).

Distribution: Russia (Ural); occurring in meadows and scrubs, in mountains.

Specimens examined: RUSSIA; Ekaterinburg Reg., C Ural. Mt. Volchikha, 25.5.1966, Storozheva (MHA); Didina, 21.5.1977, Storozheva (MHA); Chusova River, Mt. Kamenj Georgievski, 21.5.1979, Storozheva (MHA).

According to the author's description, *A. uralensis* is characterized by ternate short-petiolate involucral leaves with linear terminal lobes and 5–6 oblong tepals. Pritzel (1841) regarded this species as close to *A. caerulea*, and Juzepchuk (1937) to *A. ranunculoides*.

This species is closest to *A. caerulea* (as a sister species) and in addition to tepal characteristics mentioned above, it differs from the latter by its restricted geographical area (an endemic of the Urals), and also by number of chromosomes (tetraploid).

### 5. *Anemone ranunculoides* L., Sp. Pl. 541 (1753).

TYPE: "Ranunculus nemorosus luteus. Habitat in Europe borealis pratis nemorosis", N 710.30. (lectotype designated here—LINN!).

*Anemone nemorosa-lutea* Crantz, Stirp. Austr. 1-2: 101 (1762).

*Anemone flava* Gilib, Fl. Lith. 2: 274 (1781).

*Anemone ranunculoides* L. subsp.

*europaea* Korsh., Fl. Vost. Evr. Ross. 56 (1892).

*Anemone ranunculoides* L. subsp. *jenisseensis* (Korsh.) Krylov & Steinb. in Tr. Bot. Muz. Ros. Akad. Nauk 17: 60 (1918).

*Anemone ranunculoides* L. subsp. *wockeana* Ashers. & Graebn., Fl. Nordost. Deutsch. Flachl. 332 (1898).

*Anemone ranunculoides* L. vars. *latisecta* Schur, *subumbellata* Schur, Enum. Pl. Transsilv. 4 (1886).

*Anemone ranunculoides* L. var. *latifolia* Ulbr. in Bot. Jahrb. 37: 215 (1906).

*Anemonanthea ranunculoides* (L.) A. Gray in Nat. Arr. Brit. Pl. 2: 725 (1821).

*Anemonoides ranunculoides* (L.) Holub in Folia Geobot. Phytotax. Praha 11: 81 (1973).

Rhizomes long and branched, prostrate to ascending, 2–5 mm in diameter. Basal leaves 2–3, scale-like, and solitary, with distinct blades; petioles 4–20 cm long, glabrous; blades ternate to biternate, 2–4 × 2–4 cm, adaxially glabrous or sparsely pilose, abaxially glabrous; petiolules 2–5 mm long; central leaflets 3-lobed, ovate to rhombic; bases cuneate; margins crenate to serrate, apices acuminate; lateral segments 2-parted or deeply 2-lobed, leaf petioles 3–5 cm × 1–2 mm, glabrous or sparsely pilose; blades ternate, 3–6 × 2–4 cm, adaxially glabrous or sparsely pilose along veins; petiolules 2–5 mm long; central leaflets 3-parted to 3-lobed, ovate to rhombic, bases cuneate, margins crenate-serrate, apices acute; lateral leaflets similar to central ones, but 2-parted (Fig. 1D). Pedicels 2–5 cm long, pilose. Tepals 5–8 (–10), broadly ovate to obovate, 12–20 × 5–10 mm, yellow, with narrow bases and rounded apices, dimorphic: outer ones abaxially densely pubescent, basal veins 5–7, vein anastomoses 1–2; inner ones sparsely puberulent along central vein, basal veins 2–3, without anastomoses. Stamens 4–6 mm long; filaments apically slightly dilated; anthers ellipsoid, connectives wide. Ovaries ovoid, 0.6–1.5 mm long, basally narrowed,

densely puberulent, hairs 0.1–0.3 mm long; styles straight or curved, 0.8–1 mm long; stigmas subcapitate (Fig. 2E). Achene bodies ovoid to ellipsoid, slightly compressed, with narrow ribs, 2–4 × 1.5–2.5 mm, densely puberulent (hairs 0.2–0.3 mm long); styles curved, 0.8–1.5 mm long, glabrous; stigmas linear (Fig. 3B).

Chromosome number:  $n = 8$ , 24 (Chupov 1975); 16 (Baumberger 1970).

Distribution: Europe (a lot of countries), Caucasus, Asia Minor (Turkey); occurring in open forests or shady slopes.

Specimens examined: **UKRAINE**; Kiev Reg., Goloseevo close Kiev, 12.4.1920, Oksijuk (KW); 16.4.1923, Dubovik (KW); 10.5.1928, Polonskaya (KW); 24.4.1946, Majevskaya (KW); Lysa Gora near Kiev, 30.4.1977, Klokov (KW); Bila Tserkva, 29.4.1923, Grodzinski (KW); Bucha, 1.5.1928, Polonskaya (KW); Borodyanka, Babka, 9.5.1980, Andrienko (KW); Kharkov Reg., Pomerky, 9.4.1915, Kotov (KW); Sokolnyki near Kharkov, 17.4.1922, Kozlov (KW); Zhuravlevka, 3.5.1938, Kotov (KW); 3.5.1938, Mykhailenko & Osadcha (KW); Cherkasy Reg., near Smela, Sunky, 4.4.1897, Rakochi (KW); Jablunivka, Repyashne, 25.4.1924, Kleopov (KW); Poltava Reg., Vorskla River, Kyshenjka, 9.4.1897, Zinger (KW); Khorol, Stezhky, 30.4.1924, Polonskaya (KW); Sumy Reg., Miropolski Distr., Junakovka, 9.6.1954, Gryny (KW); Chernigov Reg., Ignynski Distr., Kachanovka, 3.4.1957, Grynj (KW); Donetsk Reg., Avdeevski Distr., Jakovlevka, 19.4.1962, Dubovik (KW); Amvrosievski Distr., Novo-Petrovka, 24.4.1962, Dubovik (KW); Zakarpatski Reg., Uzhgorodski Distr., Antalovetska Polyana, 10.5.1956, Chopik (KW); Chernivtsi Reg., Tsezino, 15.4.1961, Gorokhova et al. (KW); Estonia; Polivere, Haaprala, 14.5.1962, Aasamaa 20152 (KW); Martra, 17.5.1962, Aasamaa 20144 (KW); Dakvere, Kadrina, close village Vahnja, 25.5.1962, Aasamaa 20131 (KW); **ROMANIA**; Banatus, Timis, Baile Lipova, 23.4.1943, Borza (CLUJ); Poidureo Taucapesti, Mitropolie Vladiceni, 13.4.1955, Cerbouiscu (CLUJ); **CZECHIA**; Bohemia, Kutna Hora, Solopysky, 29.4.1965, Vasak (MHA); **SLOVENIA**; Kobic, Kobarid, 25.4.1980, Chiapella 10186 (MHA); **GERMANY**; Halle, Saale, 25.4.1980, Skwortsow (MHA); Gotha et Eisenach, 3.5.1980, Skwortsow (MHA); **FRANCE**; Dep. Pyrenees-Atlantiques, Vallee d'Ossau, 16.5.1986, Lazare 13055 (MHA); Dep. du Haut-Rhin, Colmar, 27.4.1978, Rastetter 9169 (MHA); Dep. du Bas-Rhin, Soufflenheim, 18.4.1979, Schneider 9170 (MHA);

**ITALY**; Prov. Roma, Lazio, Castelli Romani, Velletri, 27.4.1993, Milloza et al. 15993 (MHA); **SPAIN**; Alava, Sierra de Entzia, Legumba, 23.4.1989, Uribe-Echebarria & Urrutia 206 (MHA).

The authors who worked with *A. ranunculoides* in the local floras (Chater 1973 and others) noted its ternate basal and involucral leaves (the latter with short petioles), bipartite lateral leaf segments, 2–4 flowers with 6–9 pubescent tepals and oblong pubescent carpels. Juzepchuk (1937) noted the presence of scale-like leaves on creeping rhizomes, solitary basal leaves with ternate blades (sometimes absent), the few-flowered cymes, yellow pubescent tepals, short stamens and comparatively large achenes with short curved styles.

According to our data, the main distinctions of *A. ranunculoides* from *A. nemorosa* include short narrow involucral leaf petioles, non-solitary flowers, and yellow pubescent tepals with few vein anastomoses. In view of the morphology of the flowers and achenes, this species is closer to *A. trifolia* but differs from it mainly by its monomorphic perianth, shorter achene styles, basal and involucral leaf shape (2–3-lobed or parted leaflets with mainly crenate margins, longer involucral leaf petioles and smaller blades).

The variability of many morphometric characters of *A. ranunculoides* was the basis for describing several interspecific taxa [viz., subsp. *jenisseensis* Korsh. (1892), var. *latifolia* Ulbr. (1906), var. *subumbellata* Schur (1886), etc.], but in the present treatment these are not accepted as subspecific taxa.

## 6. *Anemone udensis* Trautv. & C.A.Mey., Fl. Ochot. 6 (1847).

TYPE: RUSSIA: “Khabarovski Reg., Udskoe, Siberi orient.”, 18.6.1844, Middendorf (lectotype—LE!).

*Anemonoides udensis* (Trautv. & C.A. Mey.) Holub in Folia Geobot. Phytotax. Praha 8: 166 (1973).

Rhizomes long-prostrate or ascending, 2–6 mm in diameter, having sometimes thickened nodes. Basal leaves several, scale-like (5–10 mm long), and solitary, with distinct blades; petioles 5–15 (–20) cm long, villous; blades ternate, rhombic, 3–4 × 3.5–4.5 cm, adaxially glabrous, abaxially sparsely villous; petiolules 3–5 mm long; central leaflets undivided, obovate; bases cuneate; margins crenate to incised-dentate; apices acute to obtuse; lateral leaflets similar to central ones, but oblique, ovate to obovate. Scapes 15–25 (–40) cm long, spreading-pubescent; 1-flowered. Involucral leaf petioles 2–3 cm × 1–2 mm; blades ternate, similar to those in basal leaves, but larger, rhombic-pentagonal, 4–7 × 5–7 cm, abaxially sparsely puberulent; petiolules 3–5 mm long; central leaflets mainly undivided, rhombic-obovate; bases cuneate; margins crenate to serrate; apices broadly acute to obtuse; lateral segments similar to central ones, but oblique-elliptic (Fig. 1E). Pedicels 5–10 cm long, puberulent. Tepals 5, obovate-elliptic, with wide bases and narrow apices, white, 10–18 × 5–13 mm, appressed-pilose (sometimes subglabrous); basal veins 5–7, vein anastomoses 5–9. Stamens 4–6 mm long; filaments filiform; anthers ellipsoid, connectives wide. Ovaries oblong-ovoid, 1–2 mm long, densely covered with hairs 0.1–0.2 mm long; styles straight or curved, 1–1.5 mm long; stigmas linear (Fig. 2F). Achene bodies basally slightly narrowed, ovoid, slightly compressed, with narrow ribs, 2–3 × 1.5 mm, densely puberulent (hairs 0.1–0.2 mm long); styles straight to curved, 1.5–2 mm long, glabrous; stigmas linear (Fig. 3C).

Chromosome number:  $n = 24$  (Starodubtsev 1991).

Distribution: NE Asia: Russia (Far East), China (Jilin, Liaoning), N Korea; occurring in forests or shady slopes, alt. 200–500 m.

Specimens examined: RUSSIA; Primorje Reg., Ocean Station, 29.4.1956, Voroshilov 8193 (MHA); Suputinka River, Mountain-Forest Station, 17.6.1959,

Shreter (MHA); near Vladivostok, Bagrationa Station, 28.5.1976, Nechaeva (MHA); Sputnik, 1.6.1980, Jakubov (MHA); 5.6.1992, Kharkevich & Buch (MHA); Sikhote-Alinj Reserve, Medvezhyi, 8.6.1958, Mutsertony (MHA); Kavalarov Distr., Povorot, 23.5.1980, Starodubtsev 6104 (MHA); Tetjukhe Distr., Tetjukhe, 30.6.1964, Chizhevskaya (MHA); CHINA; Uizimi, 10.6.1905, Syuzev (LE).

The authors of this species noted its long and thin stolon-like rhizomes, large involucral leaves, and white pubescent tepals, but they found no basal leaves. However, Juzepchuk (1937) described the long bract petioles, their short petiolules, and solitary flowers.

The most distinct characters of this taxon are the narrow involucral leaf petioles, leaflet petiolules 3–5 mm long, and 5 elliptic pilose tepals 10–18 mm long with 5–9 anastomoses. We confirm the opinion of Starodubtsev (1991) concerning the alliance of *A. udensis* and *A. umbrosa*. However, the latter differs from the former by its 5–8 glabrous tepals having solitary vein anastomoses and much shorter leaflet petiolules. Nevertheless, we believe that *A. udensis* is closest to *A. trifolia*, having in common with it such characters as the undivided basal and involucral leaflets, involucral leaf petioles 1–3 cm long, monomorphic tepals, and achene styles 1.5–2.5 mm long.

## 7. *Anemone trifolia* L., Sp. Pl. 540 (1753).

TYPES: "Habitat in Gallia", N 710.24 (LINN!); *Anemone* 2, Herb. Clifford (lectotype-BM!).

*Anemone trifolia* L. subsp. *trifolia*.

*Anemonanthea trifolia* (L.) Niewl. in Amer. Midl. Nat. 3: 174 (1914).

*Anemonoides trifolia* (L.) Holub in Folia Geobot. Phytotax. Praha 8: 166 (1973).

Subsp. *albida* (Mariz) Ulbr. in Bot. Jahrb. 37: 220 (1906).

TYPE: PORTUGAL: "Serra do Gerez: Leonte, Caldas," Henrique & Tait (Herb.?).

*Anemone albida* Mariz in Bol. Soc. Brot. 4: 101 (1886).

*Anemonoides albida* (Mariz) Holub in Folia Geobot. Phytotax. Praha 9: 166 (1973).

Subsp. *brevidentata* Ubaldi & Puppi in Candollea 44: 145 (1989).

TYPE: ITALY: "Borzonasca (Genova), iuxta viam ad Brizzolara in silva Ostryae carpinifoliae", 2.5.1979, Ubaldi (holotype—BOLO).

Rhizomes long-branched, horizontal to ascending, 2–4 mm in diameter. Basal leaves 2–3, scale-like, and solitary, with distinct blades; petioles 8–25 (–30) cm long, sparsely pilose; blades ternate, 3–5 (–9) × 4–6 cm, adaxially sparsely pilose along veins, abaxially pilose throughout; petiolules 3–5 mm long; central leaflets undivided, ovate to elliptic; bases cuneate; margins serrate to dentate; apices acuminate; lateral leaflets similar to central ones, but oblique. Scapes 12–25 (–35) cm long, glabrous or sparsely pilose; cymes 1–2-flowered. Involucral leaf petioles 1–3 cm × 1–2 mm, glabrous or sparsely puberulent; blades ternate, similar to those in basal leaves, but larger, 4–8 × 5–10 cm, pilose; petiolules 1–2 mm long; central leaflets undivided, rhombic to elliptic; lateral leaflets similar to central ones, but oblique (Fig. 1F). Pedicels 3–8 (–10) cm long, pilose. Tepals 5–8, elliptic, with wide bases and acute apices, white or bluish, 12–20 × 8–12 mm, glabrous; basal veins 3–5, vein anastomoses solitary. Stamens 4–8 mm long; filaments apically dilated; anthers oblong-ellipsoid, connectives wide. Ovaries oblong-ovoid, basally narrowed, 0.7–2 mm long, densely covered with hairs 0.1–0.2 mm long; styles straight or slightly curved, 0.7–1 mm long; stigmas linear (Fig. 2G). Achene bodies ovoid-ellipsoid, slightly compressed, with narrow ribs, 3–4 × 1.5–2 mm, densely puberulent (hairs 0.1–0.2 mm long); styles apically curved, 1–1.5 mm long, glabrous; stigmas linear (Fig. 3D).

Chromosome number: n = 8 (Baumberger

1970, Favarger 1961), 16 (Langlet 1932).

Distribution: Europe (Finland, Austria, France, Spain, N Portugal, Italy, Croatia, Bosnia & Herzegovina, Slovenia, Hungary, Romania); occurring in forests and forest margins, alt. 100–1800 m.

Specimens examined: AUSTRIA; Carinthia, prope urbem Klagenfurt, 1821, Jabornegg (KW); Klagenfurt, 1825, Schult (KW); Carinthia, Villach, Dobratsch, 10.9.1990, Skwortsow (MHA); ITALY; Apennines, 1811, Gaudin (MHA); Mts. Andepus et Safira Croc, 1854, de Pavillon (KW); Prov. Udine, Valli del Natisone, 11.5.1980, Chiapella (MHA).

The author's description included the presence of rhizomes, ternate basal leaves with ovate undivided serrate leaflets, and one-flowered stems. Pritzel (1841) noted the nodulose rhizomes, solitary basal leaves with subsessile segments, involucral leaves on distinct petioles, and glabrous or pubescent carpels. In their treatments of *Anemone* for the "Flora Europaea" both Tutin (1964) and Chater (1973) regarded *A. trifolia* as allied to *A. nemorosa*, and Chater mentioned its 3-parted (not ternate) basal leaves without any further divisions (which are frequently absent).

This species has some major distinctions from *A. nemorosa* (shape of basal and involucral leaf blade leaflets, narrow involucral leaf petioles, monomorphic perianth, achenes with narrow ribs, and linear stigmas). However, the same characters render it close to *A. udensis*, although *A. trifolia* distinctly differs from *A. udensis* by its few-flowered cymes, 5–8 glabrous tepals with wide bases and apices, having solitary vein anastomoses.

*Anemone trifolia* is known as a variable taxon with several subspecies or varieties. We accept three subspecies of *A. trifolia*: subsp. *trifolia*, *albida* and *brevidentata*.

#### Key to the subspecies

- 1a. Tepals white; achene heads nodding.....  
.....b. subsp. *albida*
- 1b. Tepals mainly bluish; achene heads erect

- .....2  
 2a. Tepals 15–20 mm long; scapes 20–25 cm long; leaf blade teeth distinct.....  
 .....a. subsp. *trifolia*  
 2b. Tepals 10–15 mm long; scapes 15–20 cm long; leaf blade teeth minute .....  
 .....c. subsp. *brevidentata*

7a. *Anemone trifolia* L. subsp. *trifolia*.

Plants are characterized by all features of species as well as its erect achene heads, distributed throughout its range except the Iberian Peninsula.

7b. *Anemone trifolia* L. subsp. *albida* (Mariz) Ulbr.

Plants are characterized by white flowers and nodding achene heads; occurring in NW Spain and Portugal.

7c. *Anemone trifolia* L. subsp. *brevidentata* Ubaldi & Puppi.

Plants differ from those of subsp. *trifolia* by the smaller size of all parts, including the flowers, and in particular, the shorter leaf blade teeth (ca. 1 mm deep); occurring in Apennines.

8. *Anemone umbrosa* C.A.Mey. in Ledeb., Fl. Alt. 2: 361 (1830).

TYPE: "In sylvis umbrosissimis ad rivulum Grammatucha prope Riddersk Sibiriae altaiae", Ledebour 795 (holotype—LE!).

*Anemone koraiensis* Nakai in Bot. Mag. Tokyo 33: 7 (1919). TYPE: "Corea media, in campus Senpo," Ishidaya 3089 (holotype—TI!).

*Anemone umbrosa* C.A.Mey. subsp. *extremiorientalis* Starod. in Bot. Zhurn. 67: 353 (1982). TYPE: "Oriens Extremus, Primorje Meridionalis, secus fluvium Li-Fudin," 21.5.1869, Maximovicz (holotype—LE!).

*Anemonoides umbrosa* (C.A.Mey.) Holub in Folia Geobot. Phytotax. 8: 166 (1973).

*Anemonoides extremiorientalis* (Starod.) Starod., Vetrynytsya 162 (1991).

Rhizomes horizontal or ascending, long-

branced, 1–1.5 mm in diameter. Basal leaves 2–3, scale-like, and solitary, with distinct blades; petioles 5–15 cm long, puberulent or subglabrous; blades 3-sected, pentagonal, 2–4 × 2–4 cm, appressed-puberulent or glabrous; petiolules 1–2 mm long; central segments 3-lobed, elongate-ovate; bases cordate to cuneate; margins serrulate; apices acuminate to obtuse; lateral segments unequally 2-lobed, ovate to orbicular; bases narrowly cuneate; margins crenate to dentate. Scapes 8–20 (–30) cm long, subglabrous or pilose; cymes 1-flowered. Involucral leaf petioles 1–2 (–3) cm × 1–2 mm, glabrous or pilose; blades 3-sected, similar to those in basal leaves, pentagonal to triangular, 2–4 × 3–5 cm, puberulent; segments subsessile; central segments 3-lobed, rhombic; lateral segments unequally 2-lobed, obovate to elliptic (Fig. 1G). Pedicels 3.5–6 cm long, puberulent or villous. Tepals 5, elliptic, with wide bases and apices, white, 7–14 × 4–10 mm, sparsely puberulent; basal veins 5–6, vein anastomoses absent (rarely solitary). Stamens 4–6 mm long; filaments filiform; anthers ellipsoid; connectives narrow. Staminodes 2.5–4 mm long sometimes present. Ovaries basally narrowed, oblong-ovoid, 1–1.2 mm long, densely covered with hairs 0.1–0.3 mm long; styles straight or slightly curved, 0.8–1 mm long; stigmas slightly dilated (Fig. 2H). Achene bodies ovoid-ellipsoid, 2–4 × 1.5–2 mm, densely puberulent (hairs 0.2–0.3 mm long); styles straight or slightly curved, 0.7–1 mm long, glabrous; stigmas linear.

Chromosome number: n = 8 (Starodubtsev 1982).

Distribution: NE Asia: Russia (Far East), China (Heilongjiang, Jilin, Liaoning), Korea; occurring in forests and shadow slopes, alt. 200–500 m.

Specimens examined: RUSSIA; Primorje Reg., Nadezhdinski Distr., close Baranovskaja, 3.6.1974, Kharkevich (MHA); near Vladivostok, 17.4.1976, Nechaeva (MHA); Tetjukhe Distr., near Tetjukhe,

17.6.1964, Chizhevska (MHA); Khasanski Distr., Kedrovaja Padj Reserve, 18.10.1977, Makarov (MHA); Ternej Distr., Kunami, 19.6.1985, Shaulska (MHA); **KOREA**; Manchuria, Prov. Cham-gyon, Mt.Musanga, 4.6.1897, Komarov (LE).

This species was described as close to *A. nemorosa* on the basis of its ternate basal and involucral leaves (distinct petioles in *A. nemorosa*), and solitary flowers with 5 white pubescent tepals. Juzepchuk (1937) noted its deeply bipartite lateral leaflets (resemble palmatifid) and short thickened carpel stigmas. Recently, Starodubtsev (1991) separated *A. extremiorientalis* from *A. umbrosa* on the basis of its basal and involucral leaf blade distinctions, and he classified both species in the genus *Anemonoides*.

*Anemone umbrosa* differs from *A. nemorosa* by its narrow involucral leaf petioles and several essential flower characters (e.g., monomorphic perianth, pubescent tepals without anastomoses). It is rather close to *A. soyensis*, having in common with the latter leaflet petiolules 1–2 mm long, 1-flowered scapes and glabrous tepals lacking vein anastomoses. Because of the variability of the shape of the leaf blades (the diagnostic character), we are not recognizing *A. extremiorientalis*.

#### 9. *Anemone soyensis* Boiss. in Bull. Herb. Boiss. 7: 590 (1899).

TYPES: JAPAN: Hokkaido, Prov. Kitami, Cape Soya, 20.6.1891, Faurie 7212 (lectotype, designated by Hara in 1976–P); Soya Division, Wakkai, 19.5.1926, Saito 1747 (paratype–BM!).

*Anemone debilis* Fisch. ex Turcz. var. *soyensis* (Boiss.) Makino in Bot. Mag. Tokyo 19: 86 (1905).

*Anemone umbrosa* C.A.Mey. var. *yezoensis* Miyabe ex Matsum., Shokubutsu Meii rev. ed. 23 (1895), nom. nud.

*Anemone yezoensis* Koidz. in Bot. Mag. Tokyo 31: 138 (1917). TYPE: JAPAN, Hokkaido, Prov. Ishikari, Mt. Daisetsu

Koidzumi [lectotype (designated by Hara in 1976–TI)].

*Anemone sciaphila* M.Popov in Bot. Mater. Herb. Komarov Bot. Inst. Akad. Nauk URSS 14: 141 (1951). TYPE: RUSSIA: Sachalin, 18.5.1948, Popov (holotype—LE!).

*Anemone umbrosa* C.A.Mey. subsp. *sciaphila* (M.Popov) Starod. in Bot. Zhurn. 67: 354 (1982).

*Anemonoides soyensis* (Boiss.) Holub in Folia Geobot. Phytotax. Praha 11: 81 (1976).

*Anemonoides sciaphila* (M.Popov) Starod. in Vetryenytz 162 (1991).

Rhizomes horizontal or ascending, long, cylindric, 1–2 mm in diameter. Basal leaves 2–3, scale-like (3–5 mm long), and solitary, with distinct blades; petioles 10–25 cm long, glabrous; blades 3-sected, pentagonal, 2–4 × 2–4 cm, adaxially sparsely pilose; petiolules 1–2 mm long; central segments toothed, ovate to rhombic; bases cuneate; margins crenate-dentate; apices acute to obtuse; lateral segments similar to central ones, but basally oblique. Scapes 10–20 cm long, subglabrous; cymes 1-flowered. Involucral leaf petioles 1–2 cm × 1–2 mm, glabrous; blades 3-sected, wide-elliptic, 2–4 × 2–3 cm, glabrous or pilose along margins; petiolules 1–2 mm long; central segments elliptic to oblanceolate; bases narrowly cuneate; margins crenate to serrate; apices acuminate; lateral segments similar to central ones (Fig. 1H). Pedicels 2–5 (–7) cm long, pilose. Tepals 5–7, elliptic-obovate, with wide bases and apices, white, 9–12 × 4–8 mm, glabrous; basal veins 3–5, vein anastomoses absent (sometimes solitary). Stamens 3–7 mm long; filaments filiform; anthers oblong-ellipsoid, connectives narrow. Ovaries narrow-ovoid, 1–2 mm long, densely covered with hairs 0.01 mm long; styles slightly curved, 0.5–0.8 mm long; stigmas linear (Fig. 2I). Achene bodies ovoid-ellipsoid, 4–5 × 1–2 mm, sparsely puberulent (hairs less than 0.1 mm long); styles curved to recurved, ca. 1 mm

long, glabrous; stigmas linear.

Chromosome number:  $n = 16$  (Starodubtsev 1982).

Distribution: NE Asia: Russia (Sakhalin), Japan (Hokkaido); occurring in forests, alt. 100–1500 m.

Specimens examined: RUSSIA; Sakhalin, 18.5.1948, Popov (LE); Dolinski Distr., near Dolinsk 15.5.1949, Tolmachev (MHA); 2.5.1953, Gyzha & Motorina (KW); 6.7.1980, Starodubtsev (MHA); Korsakovski Distr., near Novikova, 8.6.1962, Egorova 75 (MHA); Mt. Majorova, 11.6.1966, Egorova 3353 (MHA); Starodubskoe, 6.5.1968, Egorova & Alekseeva (LE); Okhotskoe, 17.5.1981, Mazurenko & Khokriakov (MHA); Evstafievo, 5.6.1981, Mazurenko & Khokriakov (MHA). CHINA; Lyanonin, Benjsi, Sezsiachun, 19.5.1950, Noda (LE). JAPAN; Hokkaido, Mt. Ashibetsu, Furano-shi, 13.6.1978, Mimoro & Tsugaru 4896 (MHA); Vagishiri, Haboro-cho, Tomamae-gun, 5.6.1979, Mimoro 2025 (MHA); Kitami Prov., Utanobori, 29.4. 1972, Yamanoi 108 (TNS).

The status of *A. soyensis* was debatable for a long time, and was variously regarded as *A. debilis* var. *soyensis* or *A. umbrosa* subsp. *sciaphila*. Moreover, similar plants were described twice as *A. yezoensis* (from Japan) and as *A. sciaphila* (from Sakhalin).

In our opinion, *A. soyensis* is allied to *A. umbrosa* and differs from the latter mainly by shape of central segments of the basal leaves (3-lobed rhombic in the former and serrate elongate-ovate in the latter), and larger glabrous tepals, but smaller achenes.

10. *Anemone debilis* Fisch. ex Turcz. in Bull. Soc. Nat. Mosc. 27: 274 (1854).

TYPE: RUSSIA, Kamtchatka, Tigil, Rieder (lectotype—LE!).

*Anemone ranunculoides* L. var. *gracilis* F.Schmidt in Linnaea 6: 574 (1831).

*Anemone linearis* Schldt. ex Ledeb., Fl. Ross. 1: 14 (1841).

*Anemone caerulea* DC. var. *gracilis* (Schldt.) Ledeb., l. c. (1841).

*Anemone gracilis* F.Schmidt in Mem. Acad. Sci. St.-Petersb. 7: 102 (1868).

*Anemone caerulea* DC. var. *debilis* (Fisch.

ex Turcz.) Huth in Bull. Herb. Boiss. 7: 1074 (1897). TYPE: JAPAN: Yesso, Kiu-Siu und Riu-Kiu-Inseln auf Rebunshiri und Riishiri.

*Anemone caerulea* DC. subsp. *gracilis* (F. Schmidt) Ulbr. var. *gracilis* Ulbr. in Bot. Jahrb. 37: 218 (1906).

*Anemone caerulea* DC. subsp. *gracilis* Ulbr. var. *linearis* (Schldt.) Ulbr., l. c. (1906).

*Anemone gracilis* F.Schmidt var. *debilis* (Fisch. ex Turcz.) Koidz. in Bot. Mag. Tokyo 31: 139 (1917). RUSSIA: Kamtchatka, Fischer (lectotype—LE!).

*Anemone gracilis* F.Schmidt var. *linearis* (Schldt. ex Ulbr.) Koidz., l. c. (1917).

*Anemone debilis* Fisch. ex Turcz. var. *linearis* (Schldt. ex Ulbr.) Makino & Nemoto, Fl. Jap. ed. 1: 961 (1925).

*Anemone debilis* Fisch. ex Turcz. var. *gracilis* (Schldt.) H.Hara in Bot. Mag. Tokyo 49: 6 (1935).

*Anemonoides debilis* (Fisch. ex Turcz.) Holub in Folia Geobot. Phytotax. Praha 8: 166 (1973).

Rhizomes long, horizontal or ascending, 1.5–3 mm in diameter. Basal leaves 2–3, scale-like (5–8 mm long), and solitary, with distinct blades; petioles 3–8 (–15) cm long, glabrous; blades ternate, pentagonal, 2–3 × 2–4 cm, adaxially pilose; petiolules 2–5 mm long; central leaflets narrow-ovate to lanceolate-elliptic; bases cuneate; margins crenate to coarsely toothed; apices acute or obtuse; lateral segments similar to central leaflets, but smaller and slightly oblique. Scapes 5–15 (–20) cm, pilose; cymes 1-flowered. Involucral leaf petioles 1–2 cm × 1–2 mm, basally slightly vaginate, mainly subglabrous; blades ternate, 2–5 × 2–3 cm, glabrous or rarely sparsely pilose along veins; petiolules 2–5 mm long; central leaflets linear-lanceolate; bases narrowly cuneate; margins entire to serrulate or toothed; apices acuminate; lateral leaflets similar to central ones (Fig. 1I). Pedicels 1–2 cm long, pilose. Tepals 5–6, oblong-

elliptic, with narrow bases and rounded apices, white or greenish abaxially,  $5\text{--}7 \times 2\text{--}5$  mm, glabrous; basal veins 3–5, vein anastomoses absent. Stamens 2.5–5 mm long; filaments filiform; anthers ellipsoid, connectives wide. Ovaries ovoid, 0.5–1 mm long, densely covered with hairs 0.1 mm long; styles straight or curved, 0.4–0.7 mm long; stigmas linear (Fig. 2J). Achene bodies ovoid-ellipsoid, slightly compressed, with narrow ribs,  $2\text{--}4 \times 1\text{--}1.5$  mm, densely puberulent (hairs less than 0.1 mm long); styles straight to curved, 0.5–1.2 mm long, glabrous; stigmas linear (Fig. 3E).

Chromosome number:  $n = 8$  (Kurita 1961, Starodubtsev 1991).

Distribution: NE Asia: Russia (Far East, Sakhalin, Kamchatka, Kuriles), Japan (Hokkaido, Honshu); occurring in coniferous forests and open slopes, in mountains.

Specimens examined: RUSSIA; Primorje Reg., Nikolaevsk near Amur, 18.5.1903, Shestunov (LE); Tatarski Strait, De-Castri Bay, 23.5.1912, Derbek (LE); Sovetskaja Bay, near sea, 31.5.1916, Krylov (E); S Sakhalin, vicinity South Sakhalinsk, Kanuma, 5.10.1948, Popov (LE); Firsovo near sea, 13.6.1959, Pobedimova & Konovalova 298 (LE); S Kamchatka, Petropavlovsk, 17.6.1921, Hultén (LE); Kuriles, Kunashir, near Urvitovo, 6.6.1963, Egorova 899 (LE); Magadanski Reg., Khasynski Distr., near Snezhnaja, Dolina, 21.6.1975, Khokhriakov (MHA); Kamchatka Peninsula, Elizovo, 25.7.1969, Dvorakovskaya (MHA); Sakhalin: near Village Terpenie, 25.6.1965, Egorova (MHA); near Juzhno-Sakhalinsk, 16.6.1980, Starodubtsev & Nedoluzhko (MHA); Tymovski Distr., Kirovskoe, 25.6.1980, Starodubtsev & Nedoluzhko (MHA); near Village Aleksandrovka, 26.6.1980, Starodubtsev 5521 (MHA). JAPAN; Hokkaido, Prov. Tokachi, Oikimanai Lake, 28.5.1975, Furuse 8628 (K); Mt. Ashibetsu, Furano-shi, 13.6.1978, Mimoro & Tsugaru 4897 (MHA); Honshu, Nikko, Tochigi Pref., 7.1924, Momiko (LE); Manza Pass, 1800 m, 19.5.1963, Kanai (LE); Nagano Pref., Mt. Ogura, Kitaaiki-mura, 26.5.1976, Furuse 11066 (K); Shizuoka Pref., Mt. Tekaridake, alt. 2500 m, 15.6.1979, Kadota 7068 (TNS).

*Anemone debilis* was firstly described as a part of several different species (e.g., *A. gracilis*, *A. caerulea*). Moreover, there was considerable taxonomic confusion

concerning *A. debilis*. However, Juzepchuk (1937), Ohwi (1957) and Starodubtsev (1991) noted the short thick branches of its rhizomes, linear-lanceolate leaf segments, solitary flowers with 5 small white glabrous tepals, and narrowly ovate, small (ca. 3 mm long) pubescent achene bodies.

*Anemone debilis* has several characters (e.g., greenish-white glabrous tepals without vein anastomoses) which are absent in *A. caerulea*, but present in *A. soyensis*. In addition, both of these taxa have similar achenes. Therefore, we confirm the opinion of Dutton (1996) concerning the close relationship of these species, together with *A. umbrosa*. According to our data, *A. debilis* differs from *A. soyensis* mainly by its smaller tepals (4–8 mm long only in the former and 10–15 mm in the latter), colour (white-greenish and white) and shape (narrow and wide bases).

Ser. 2. *Altaicae* (Starod.) Ziman, Kadota & Bulakh.

11. *Anemone altaica* Fisch. ex C.A.Mey. in Ledeb., Fl. Alt. 2: 362 (1830).

TYPES: "In montibus altaicus", Schangin [(herb. apud Ledebour) holotype—LE!]; "In montibus Kurtschum haud rara", Meyer; "Ad portum Petro-Pauli Kamtschatcae", A. de Chamisso (paratypes—LE!).

*Anemone nemorosa* L. subsp. *altaica* (Fisch. ex Ledeb.) Korsh. in Acta Hort. Petropol. 12: 29 (1892).

*Anemonoides altaica* (Fisch. ex C.A.Mey.) Holub in Folia Geobot. Phytotax. Praha 8: 166 (1973).

Rhizomes horizontal stolon-like, ca. 2 mm in diameter, and oblique short nodulose, 5–8 mm in diameter. Basal leaves 2–3, scale-like (4–6 mm long), and solitary, with distinct blades; petioles 4–8 cm long, subglabrous; blades ternate, 2.5–4 × 3–6 cm, glabrous; petiolules 5–10 mm long; central leaflets 3-lobed, pentagonal; bases cuneate; margins crenate to denticulate; apices acuminate or obtuse; lateral leaflets similar

to central leaflets, but bilobate or bicleft, slightly oblique, and the ultimate lobules obtuse. Scapes 10–20 (–30) cm long, subglabrous; cymes 1-flowered. Involucral leaf petioles 1–3 cm × 3–5 mm, flat and winged, sparsely puberulent or subglabrous; blades ternate, larger than those in basal leaves, 3–6 × 4–8 cm, puberulent; petiolules 2–5 mm long; central leaflets 3-lobed, rhombic to ovate; bases cuneate; margins irregularly dentate or serrate; apices acuminate; lateral leaflets smaller, oblique, ultimate lobules obtuse (Fig. 1J). Pedicels 3–5 cm long, puberulent. Tepals 8–12, oblong to narrowly elliptic, with rounded bases and apices, white, bluish or reddish-violet, dimorphic, glabrous, in two circles: outer tepals 20–25 × 8–12 mm, basal veins 5–9, vein anastomoses 3–5; inner tepals 10–12 × 3–4 mm, without anastomoses. Stamens 4–8 mm long; filaments filiform; anthers ellipsoid, connectives wide. Ovaries narrow-ovoid, basally narrowed, 1–1.5 mm long, densely covered with hairs 0.1–0.3 mm long; styles straight, 0.4–0.7 mm long; stigmas subcapitate (Fig. 2K). Achene bodies basally slightly narrowed, ovoid, slightly compressed, with narrow ribs, 4–5 × 1.5–2 mm, densely puberulent (hairs 0.1–0.3 mm long); styles curved to recurved, 0.5–1 mm long, basally puberulent; stigmas slightly dilated (Fig. 3F).

Chromosome number:  $n = 8$  (Baumberger 1970), 16 (Chupov 1975), 32 (Lavrenko and Serditov 1986).

Distribution: Europe (Romania), NE Asia: Russia (Altai), China (Henan, Hubei, Shanxi, Xinjiang); occurring in forests and under bushes, also by streams, alt. 1200–1800 m.

Specimens examined: RUSSIA; Turukhanski Reg., Podkamennaya Tunguska, 6.1888, Kryvchikova (KW); Pechorski Reg., 1881, Ivanitski (MHA); Tomski Reg., near Tomsk, 9.5.1903, Nekrasov (KW); Stepanovka, 28.5.1923, Sergievskaya (KW); Kutashova Village, 20.5.1933, Konusova & Yakubova (KW); Ushayka River, 18.5.1948, Nogina & Mikhailova (KW); Kemerov Reg., near river Tesh, 20.5.1948, Kuminova

(MHA); Novosibirski Reg., Toguchinski Distr., Kotorovo, 7.6.1974, Lashchinski & Volkova (MHA).

**BASHKIRIA;** 8 km N of Ufa, Mt. Sutoloka, 2.5.1942, Kotov (KW); 11.5.1942, Kotov (KW); 18.5.1942, Kotov (KW). **RUMANIA;** Transsylvania, Muresului intre Toplita si Deda, 27.6.2000, Oroian & Ziman (KW). **CHINA;** W Hupeh, 7.4.1900, Wilson 53 (K).

*Anemone altaica* initially was separated from *A. nemorosa* on the basis of the distinctions in its rhizome and leaf shape, and tepal number and shape. Ulbrich (1906), however, regarded *A. nemorosa*, *A. altaica*, and *A. umbrosa* as “species collectiva”.

*Anemone altaica* is close to *A. nemorosa* on the basis of several characters (dilated involucral petioles, 3-parted or 3-lobed central leaflets, solitary flowers, and dimorphic glabrous tepals with 3–5 vein anastomoses), but the distinctions between these taxa are essential, and they include the types of rhizomes (dimorphic in *A. altaica*), perianth (many-leaved) and achenes (smaller but having longer styles).

*Anemone altaica* is distributed mainly in NE Asia. Recently Oroian (1997) discovered a unique population in C Europe (Romania, Transsilvania). In 2000 we re-examined plants of this population together with Orpian and we agree that plants of this population are indeed *A. altaica* (not *A. nemorosa*).

## 12. *Anemone pseudoaltaica* H.Hara in J. Jpn. Bot. 15: 767 (1939).

TYPES: JAPAN: “Hakodate (Hokkaido), iter secundum”, 1861, Maximowicz (holotype—GH!; isotypes—BM!, NY!).

*Anemone hakodatensis* Nakai in Bull. Nat. Sci. Mus. (33): 6 (1953). TYPE: JAPAN: Hondo bor. & Hokkaido austr., Prov. Uzen, 30.4.1908, Ogunimoto (lectotype—TNS!).

*Anemone altaica* Fisch. ex Ledeb. f. *albiflora* Yamam. & Tsukam. in Fl. Hakodate 37 (1932).

*Anemone pseudoaltaica* H.Hara var. *pseudoaltaica*.

*Anemone pseudoaltaica* H.Hara var. *gracilis* (H.Hara) H.Ohba in J. Jpn. Bot. 69:

116 (1994). TYPE: JAPAN: "Honsyu (Honshu). Prov. Sagami, Hakone", 30.4.1939, Hisauti" (holotype-TI!).

*Anemone pseudoaltaica* H.Hara var. *katonis* H.Ohba, I. c. (1994). TYPE: JAPAN: "Honshu Prov., Yamagata Praef., Tobishima Island", 4.1993, H.Ohba (holotype-TI!).

*Anemonoides pseudoaltaica* (H.Hara) Holub in *Folia Geobot. Phytotax. Praha* 8: 166 (1973).

Rhizomes long horizontal or ascending, 2–3 mm in diameter, and short nodulose, 5–6 mm in diameter. Basal leaves 2–3, scale-like (3–4 mm long), and solitary, with distinct blades; petioles 5–15 cm long, glabrous; blades ternate, pentagonal, 2–3 × 2–3 cm, glabrous or sparsely pilose along veins; petiolules 2–5 mm long; central leaflets deeply 3-lobed, ovate to rhombic; bases narrowly cuneate; margins serrate and incised; apices acuminate or acute; lateral leaflets wide-ovate, deeply bilobed or bipartite. Scapes 10–20 (–30) cm long, glabrous; cymes 1-flowered. Involucral leaf petioles 10–20 × 3–5 mm, basally dilated, subglabrous; blades ternate, similar to those in basal leaves, but larger, 3–6 × 3–5 cm, glabrous; petiolules 3–5 (–10) mm long (Fig. 1K). Pedicels 2.5–5 cm long, pilose. Tepals 8–12, lanceolate, with rounded bases and apices, reddish-purple or rarely whitish, 10–30 × 5–10 (–20) mm, monomorphic, glabrous; basal veins 3–5, vein anastomoses 3–5. Stamens 5–7 (–10) mm long; filaments basally dilated; anthers ellipsoid, connectives wide. Ovaries ovoid, ca. 2 mm long, densely covered with hairs 0.3–0.5 mm long; styles straight, ca. 1 mm long, stigmas sublinear (Fig. 2L). Achene bodies ovoid-ellipsoid, basally narrowed, 3.8–5 × 1.5–2 mm, sparsely puberulent (hairs 0.2–0.3 mm long); styles curved or recurved, 0.7–1.5 mm long, glabrous or basally sparsely puberulent; stigmas sublinear (Fig. 3G).

Chromosome number: n = 16, 24 (Kurita 1956, Nishikawa 1985).

Distribution: NE Asia: Japan (Hokkaido, Honshu); occurring mainly in forests, alt. 100–1200 m.

Specimens examined: JAPAN; Hokkaido, Hakodate, 1861, Maximowicz (K); Insula Jesso, circa Hakodate, 27.4.1861, Albrecht (LE); Prov. Shiribeshi, Okushiri Isl., 2.5.1983, Takahashi 3822 (MHA); Prov. Oshima, Nanae, Ōnuma Park, alt. 150m, 10.5.2003, Igarashi (TNS); Honshu, Miyagi Pref., Onoda-cho, Naruse River, 9.5.1983, Ohashi & al. 11770 (MHA); Prov. Oshima, Hakodate-shi, Mt. Hakodateyama, 4.5.1985, Takahashi 5362 (MHA); Hondo, Echino, Arakawamachi, 1.4.1956, Togashi 1283 (K); Tohoku, Prov. Rikuzen, Mt. Daito, 22.4.1977, Takahashi (K); Tominami, Prov. Uzen, Murayama-city, 4.5.1977, Takahashi (K); Fukushima Pref., Shirakawa-no-sekiato, 26.4.1978, Mimoro & Tsugaru 4659 (MHA); Fukushima, near Shinkassi-onsen, Mafune, Nishigomura, 27.4.1978, Mimoro & al. 4717 (MHA); Ishikawa Pref., Mt. Saruyama, 27.3.1987, Deguchi & al. 6575 (MHA).

This species was described from the flora of Japan as similar to *A. altaica*, but differing in the shape of basal leaf blades and tepal colour. According to our data, *A. pseudoaltaica* is close to *A. altaica* by its basal leaf blades but differs mainly by its monomorphic perianth, basally dilated filaments, basally rounded ovaries and achenes without lateral ribs, sublinear stigmas, shorter achene styles, but longer achene hairs.

In 1953 Nakai described *A. hakodatensis* as a species close to *A. altaica*, but differing mainly by its tepal colour, and later, Ohwi (1984), the author of treatment on *Anemone* for the "Flora of Japan" Ohwi (1984) did not recognize this taxon.

We examined herbarium material of *A. hakodatensis* and believe that its essential characters (rhizomes of two types, dilated and winged involucral leaf petioles up to 30 mm long, involucral leaf blades larger than those in basal leaves, and 8–12 monomorphic tepals) are similar to *A. pseudoaltaica*; therefore, we do not accept *A. hakodatensis* as a species.

*Anemone pseudoaltaica* has been regarded

as a variable taxon, and within it three varieties (e.g., vars. *pseudoaltaica*, *gracilis* (H.Hara) H.Ohba and *katonis* H.Ohba), and four forms (e.g., f. *hanagasa* Inagaki, f. *pleniflora* Inagaki, f. *tosshozana* Inagaki and f. *prolifera* Kadota) were described (Inagaki and Nakano 1964, Ohba 1994, Kadota 1998). After an examination of the herbarium material and the pertinent literature, we recognize the three varieties of *A. pseudoaltaica*.

### Key to the varieties

- 1a. Scapes 25–30 cm long; tepals 25–30 mm long.....c. var. *katonis*
- 1b. Scapes 5–20 cm long; tepals 10–25 mm long.....2
- 2a. Scapes 15–20 cm long; tepals 15–25 mm long.....a. var. *pseudoaltaica*
- 2b. Scapes 5–15 cm long; tepals 10–15 mm long.....b. var. *gracilis*

#### 12a. *Anemone pseudoaltaica* var. *pseudoaltaica*.

This variety is characterized by all features of *A. pseudoaltaica*. Plants occur in Hokkaido and Honshu (Hyogo Pref. and northward), and the above forms occur in the Mt. Tosshozan of Hokkaido and in Aomori Pref. of Honshu.

#### 12b. *Anemone pseudoaltaica* var. *gracilis* (H.Hara) H.Ohba in J. Jpn. Bot. **69**: 116 (1994).

Plants differ from those in var. *pseudoaltaica* by shorter scapes (5–15 cm), and smaller flowers (tepals 10–15 mm long).

#### 12c. *Anemone pseudoaltaica* var. *katonis* H.Ohba in J. Jpn. Bot. **69**: 116 (1994).

Plants differ from those in both other varieties by longer scapes (25–30 cm long) and larger flowers (tepals 25–30 mm long).

#### 13. *Anemone raddeana* Regel in Bull. Soc. Nat. Mosc. **34**: 16 (1861).

TYPE: “Mandshuria ad fl. Amur montes Burejae”, 4.1858, Radde (holotype—LE!).

*Anemone maximowiczii* Juz. in Kom., Fl. URSS **7**: ?? (1937).

*Anemone amagisanensis* Honda in Bot. Mag. Tokyo **49**: 1 (1934).

*Anemone juzepczukii* Starod. in Bot. Zhurn. **68**: 1016 (1983). TYPE: RUSSIA: “Oriens extremus, insula Sachalin, promontorium meridionale jugi Susunaj, vicinitis opp. Juzhno-Sachalinsk, prope pag. Kanuma”, 7.5.1948, Popov (holotype—LE!).

*Anemone raddeana* Regel var. *raddeana*.

*Anemone raddeana* Regel var. *integra* Huth in Bull. Herb. Boiss. **5**: 1072 (1897). TYPE: JAPAN: “Prope Hakodate. Iter secundum”, 1861, Maximowicz (syntype—GH!).

*Anemone raddeana* subsp. *villosa* Ulbr. in Bot. Jahrb. **37**: 221 (1906). TYPE: “So nur auf dem Festlande; auf dem Schan-Alingebirge und dessen Ausläufern, z. B. bei Bai Viktoria”, 1860, Nadimoff (syntype).

*Anemone raddeana* Regel subsp. *glabra* Ulbr., l. c. 221 (1906).

*Anemonoides raddeana* (Regel) Holub in Folia Geobot. Phytotax. Praha **8**: 166 (1973).

*Anemonoides raddeana* var. *lacerata* Y. L. Xu in Bull. Bot. Res. Forest Univ. **13**: 121 (1993). TYPE: CHINA: 4.4.1991, Y.L.Xu 888/1456814 (holotype—PE!).

Rhizomes long horizontal or ascending, 2–3 mm in diameter, and short nodulose, 4–8 mm in diameter. Basal leaves 2–3, scale-like (10–20 mm long), and solitary, with distinct blades (develop close to scapes); petioles 5–20 cm long, glabrous or sparsely puberulent; blades ternate, 2–5 × 2–4 cm, pentagonal or suborbicular, subglabrous or sparsely pubescent; petiolules 3–5 mm long; central leaflets medially 3-lobed or deeply toothed only, obovate-elliptic; bases cuneate to truncate; margins coarsely crenate to serrate; apices obtuse; lateral leaflets similar to central ones, but oblique. Scapes 10–30 cm long, subglabrous; cymes 1-flowered. Involucral leaf petioles 5–12 × 1–2 mm, glabrous; blades 3-sected, 2–4 × 2–5 cm, rhombic-

pentagonal, sericeous; petiolules 1–2 mm long; all segments narrowly ovate, apically deeply but obtusely toothed (Fig. 1L). Pedicels 1–3 cm long, sparsely puberulent or subglabrous. Tepals 9–15, linear-lanceolate, with rounded bases and apices, white-tinged purple or white, 12–20 × 4–5 mm, glabrous; basal veins 3–5, vein anastomoses 1–3. Stamens 8–15 mm long; filaments basally and apically slightly dilate; anthers ellipsoid, connectives narrow. Ovaries ovoid, basally narrowed (stalks ca. 0.1 mm long), ca. 2 mm long, densely covered with hairs 0.1 mm long; styles straight, ca. 1 mm long; stigmata slightly dilated (Fig. 2M). Achene bodies ovoid to ellipsoid, slightly compressed, with narrow ribs, 3–4 × 1.5–2 mm, densely puberulent (hairs 0.2–0.3 mm long); styles curved, 1–1.5 mm long, glabrous; stigmata sublinear.

Chromosome number:  $n = 16$  (Kurita 1956, Baumberger 1970, Starodubtsev 1991).

Distribution: Russia (Far East), China (Heilongjiang, Jilin, Shandong, Zhejiang), Japan (Hokkaido, Honshu, Shikoku), Korea; occurring in forests and meadows, alt. 100–1000 m.

Specimens examined: RUSSIA; Ussuri Reg., Ussuri Reserve, near Majski Kljuch, 14.5.1972, Kostenko (VLA); 2.5.1974, Kharkevich & Buch (MHA); Amurski Reg., Arkharinski Distr., Kundur, 4.6.1981, Starodubtsev & Nedoluzhko (MHA, VLA); Primorje Reg., village Novoshivskoe, 14.4.1913, Gurzenko (LE); Russky Island, 22.4.1921, Desulavi 302 (LE); Upper part of Suputinka Valley, 20.4.1932, Skibinskaya (LE); Khasanski Distr., village Primorski, 9.5.1980, Starodubtsev (VLA); Khasanski Distr., Kedrovaja Padj, 10.9.1980, Starodubtsev (MHA); Sakhalin, near Kholmsk, Uentomari Valley, 19.4.1948, Popov (LE); near Tymovski, 12.5.1968, Egorova & Sharomova (LE); 5.5.1972, Kostenko (VLA); 14.5 1972, Kostenko (VLA); near Dolinsk, 6.7.1980, Starodubtsev (VLA); 24.6.1982, Starodubtsev (VLA). JAPAN; Hokkaido, Insula Jesso, circa Hakodate, 1861, Albrecht (LE); Prov. Iburi, Tomakomai-shi, Misawa, 27.4.1984, Takahashi 4889 (MHA); Prov. Hidaka, Mitsuishi-gun, Mitsuishi-machi, 20.5.1984, Takahashi 4904 (MHA); Honshu, Fukushima Pref.,

Shirakawa-no-seki-ato, 26.4.1978, Mimoro & Tsugaru 4658 (MHA); Saitama Pref., Chichibu-gun, Mt. Buko, 1917, Makino 33964 (LE); Shiga Pref. Inukami-gun, Mt. Oikedake, alt. 900 m, 29.4.1963, Kodama 9964 (TNS).

This species was described from the Far East as plants with short rhizomes and large scales, solitary basal leaves with long petioles and ternate blades, and solitary flowers with 10–15 sepals. The specific status of this species was never in doubt, but its relationships remained uncertain.

*Anemone raddeana* stands within sect. Anemonanthea close to the *A. altaica*-*A. pseudoaltaica* subgroup, having in common several essential characters (rhizomes of two types, 8–12 glabrous tepals with several vein anastomoses, solitary flowers, and ovoid carpels and achenes with distinct styles). There are, however, several important distinctions, mainly in leaf shape (in *A. raddeana* the basal and involucral leaflets are toothed or medially 3-lobed, the involucral leaf petioles much shorter and narrower, the flowers have more numerous, longer but narrower tepals having fewer vein anastomoses, and dilated filaments).

Juzepchuk (1937) regarded the allied, but glabrous, plants from Japan as *A. maximowiczii*. Another allied species, *A. juzepczukii*, was described by Starodubtsev (1983) from Sakhalin on the basis of its less divided involucral leaf segments. In addition, several infraspecific taxa of *A. raddeana* were described (viz., subspp. *villosa* Ulbr., and *glabra* Ulbr.; vars. *integra* Huth and *lacerata* Y.L.Xu).

We agree with Ohwi (1984) in not recognizing of *A. maximowiczii* in the flora of Japan, and we do not support any recognition of a specific status for *A. juzepchukii*, but in following Wang & al. (2001), we accept varieties *raddeana* and *lacerata*. In this treatment, var. *lacerata* differs from var. *raddeana* by its villous basal leaf petioles, broadly rhombic basal and involucral leaf

central segment blades, and their many dentate apices. Moreover, var. *lacerata* differs also from var. *raddeana* in that it is a local endemic within China (N Zhejiang).

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キンポウゲ科イチリンソウ属のうちで広義の *Anemonanthea* 亜属の分類学的研究を行った。その結果、広義の *Anemonanthea* 亜属に、7つの新属内分類群を含む、2亜属、5節、11列を認めることができた。

パート I では、*Anemone nemorosa* L., *A. amurensis* (Korsh.) Kom. ウラホロイチゲ (ヤチイチゲ), *A. caerulea* L., *A. uralensis* DC., *A. ranunculoides* L., *A. udensis* Trautv. & C.A.Mey. バ

イカイチゲ, *A. trifolia* L., *A. umbrosa* C.A.Mey. モリイチゲ, *A. soyensis* Boiss. エゾイチゲ, *A. debilis* Fisch. ex Turcz. ヒメイチゲ, *A. altaica* Fisch. ex C.A.Mey., キクザキイチゲ *A. pseudoaltaica* H.Hara, アズマイチゲ *A. raddeana* Regel の13種について報告した。

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